IN THE

UNITED STATES COURT OF APPEALS FOR THE SIXTH CIRCUIT

Nos. 14,330, 14,331

SPARTON CORPORATION, *Plaintiff-Appellant and Cross-Appellee,* v. EVANS PRODUCTS COMPANY, *Defendant-Appellee and Cross-Appellant.*	APPEAL from the United States District Court for the Eastern District of Michigan.

OPINION OF COURT OF APPEALS

Decided August 30, 1961.

Before MARTIN, WEICK and O'SULLIVAN, Circuit Judges.

MARTIN, Circuit Judge. One of the problems long confronting railroads concerned the damage to goods in shipment resulting from movement of the freight within a freight car while in transit. An early attempt at solution, still practiced today, was the use of disposable wooden braces. Bracing used in cars to hold the freight in position is called "dunnage." This wooden disposable dunnage was nailed into position in the car so as to secure the freight against movement. The walls and floor of the car were lined with wood to receive the nails. After frequent use, this lining had to be replaced, inasmuch as repeated nailings destroyed the wood to such extent that the braces could not be fastened securely to the wall or floor. The worn-out wooden braces were discarded.

In search of a more efficient manner of protecting freight, methods were sought to develop a dunnage system that could be installed in the car permanently, the braces being fixed so as to allow adjustability in the fitting of various goods and packages into the car for shipment. The work in this field resulted in the three devices—among others—which are the subject of the three patents in suit and in the dunnage system of appellant which is alleged to infringe the patented devices. Appellee is the owner of the three patents involved.

Judge Thornton of the United States District Court for the Eastern District of Michigan held that the three patents in suit (Nampa, No. 2,679,214; Chapman-Dunlap, No. 2,834,304; and Tobin, No. 2,873,695) are valid; and that the alleged infringing device of appellant, the Sparton Tri-Belt Loader, infringes the Chapman-Dunlap and Tobin patents, but does not infringe the Nampa patent.

In the District Court proceedings, it was admitted that, if the Chapman-Dunlap and Tobin patents were valid, the Sparton Tri-Belt Loader did infringe. Therefore, in relation to the Chapman-Dunlap and Tobin patents, this court is concerned only with the question of validity. However, in considering the Nampa patent, not only is the question of validity presented, but also the issue of infringement. While the District Court found non-infringement of Nampa by appellant's Tri-Belt Loader, the owner of the Nampa patent (appellee Evans Products Company) has cross-appealed, claiming infringement. Sparton Corporation urges that, having found non-infringement, it was error for the District Court to consider the question of validity of the Nampa patent.

In appealing from the District Court's holding of validity as to all three patents, appellant Sparton Corporation

argues (1) that the correct standard of invention was not applied by the court; (2) that the rule of exhausted combination would preclude a holding of validity, each of the claims in suit being an aggregation rather than a patentable combination, and therefore invalid; and (3) that the District Court decided a moot question when it found validity after finding non-infringement.

Sparton contends further (4) that structures conforming to the disclosures of Nampa patent in suit were offered for sale and were in public use more than one year prior to application for that patent, thereby rendering it invalid. The same contention is made regarding the Chapman-Dunlap patent. Appellant also claims (5) that the District Court was in error when it found that Robert Schroeder (a former employee of appellee Evans Products Company, owner of Nampa) did wrong in taking his freight-bracing system to Sparton. It contends, moreover, (6) that certain amendments to the Chapman-Dunlap and Tobin applications render those patents invalid.

We think that the contentions of appellant are without merit.

The Evans Company has cross-appealed, arguing that the holding by the United States District Court of non-infringement of the Nampa patent by the Sparton Tri-Belt Loader is in error.

A brief description of each of the patents involved and of the Sparton Tri-Belt Loader becomes necessary.

NAMPA PATENT No. 2,679,214

The dunnage system constituting the subject of the Nampa patent consists of a series of upright bars, arranged at opposite sides of the freight car, which wall members or belt rails, removably supported on the uprights at desired heights. Connecting the belt rails from side to side are car-spanning, load-bracing, cross bars. The bars are removably and adjustably supported upon the rails.

Each cross bar is comprised of an elongated body, having heads at each end. The bar itself is composed of a "Z" shaped metal reinforcing member, sandwiched between two-by-fours, thereby presenting four uninterrupted, "buffered" freight-engaging surfaces extending from end to end of the bar. The heads, being smaller than the bar, do not extend beyond the bar and no contact is made with the freight. This enables the loading of freight over the entire width of the car.

Each head has a series of tooth-like projections that mate with similar projections on the wall members and prevent movement of the heads. Fore and aft movement of the bars is thereby prevented. Each head also contains a lip and a vertical face which are received by the wall members to avert lengthwise movement between the wall member and the bar assembly. A latch is incorporated in the head and underlies the wall member, maintaining the position of the tooth-like projections and the lip and vertical face in contact with the wall member. This aids in preventing excess movement between the head and the wall member. One head is immovably secured to the bar, but the other is fastened by an elongated neck which is freely slidable between limits in a socket moored to the "Z" shaped member, thereby enabling the bar length to adjust itself to

changes of car width that may be caused by the car walls' ballooning in transit, or by the car's being bumped during yard operations.

In use, the freight is placed in the car and the bar is located on the wall members so as to engage the freight and hold it in position. Inasmuch as the wall members are movable, the cross bars may be placed in almost any position in the car, fore and aft, or from the floor to the ceiling.

CHAPMAN-DUNLAP PATENT, No. 2,834,304

The Chapman-Dunlap equipment to hold cargo in place on ships was developed in research and development contracts with the United States Navy, but it may be used in freight cars as well.

The system is composed of grid-like patterns of long structural supporting surfaces, or belts, on the freight-supporting surfaces of the ship, or car, running lengthwise with the ship, or car, and spanned at intervals by belts. The corresponding overhead structures have matching grid-like patterns. The surfaces are provided with three equidistantly-spaced rows of identical holes, the spacing between the holes in each row being equal to that between the rows.

Upright or vertical bars extend between the floor and the overhead surface. Each bar has an elongated body and end heads, or fittings, with one fitting fixed in place on the body. The other fitting on the bar is telescopically received into the body of the member, so as to provide for changes in the length thereof when in service and when being put into place, or removed. Each end fitting carries

a pair of laterally-spaced parallel, load-bearing pins that enter the holes in the floor and ceiling surfaces. The pins are spaced from each other a distance equal to twice the distance between the rows of holes. The end fitting, fixed in place on the bar, carries a latching pin pivotally mounted thereon which extends generally parallel to the two load-bearing pins, is placed between them, and is protected thereby. The latching pin has a latching shoulder that lies behind the metal surrounding one of the holes and prevents withdrawal of the head.

The three rows of holes in the floor, the overhead surface, or belts, and the matching arrangement of the load-bearing and latching pins on the vertical bracing bars permit flexibility and freedom in the positioning of these bars, thus enhancing the load-handling ability of this equipment.

The Chapman-Dunlap structure includes tomming members, or bars, that span—and are removably secured to and supported by—the vertical bars. These bars are symmetrical, end for end, and have two identical latching-type end fittings that duplicate the end fittings of the vertical bars. Both end fittings are telescopically received into the bar body. Locking assemblies may be used to fix the length of the bars after they are installed between the verticals.

TOBIN PATENT No. 2,873,695

The Tobin patent is directed to a freight-holding system, having the particular feature known as "pitch splitting." This feature makes possible finer adjustments of the position of the freight-holding bar with relation to the freight, so as to take up any gap between the bar and the freight and to provide a snug and secure fit.

The Tobin freight-holding bars have their ends engaged in holes provided in the vertical surface of wall supports, or plates. Each end of the bar is provided with a pair of laterally-spaced load bearing pins which enter adjacent pairs of holes in the wall supports. One pair of the pins is telescopically mounted.

The holes are arranged in equidistantly-spaced vertical and horizontal rows. Consequently, the bar can be attached to the wall supports in any one of four axially rotative positions, each spaced 90 degrees apart, and therefore each bar face can be caused to face or be presented in any one of four directions.

The pins on the respective end fittings of the bars are aligned with each other endwise to the bar; but they are off center or eccentrically located relative to the longitudinal axis of the bar. Because of this eccentricity, shifting of a bar from one axially rotative position to another shifts the position of the four faces of the bar, letting a workman select the position which most snugly secures the freight in position in the car. This feature allows finer adjustments in the position of the bar than could be achieved by moving the bar to the next set of holes.

THE SPARTON TRI-BELT LOADER

The Sparton Tri-Belt Loader is similar to the patents in suit, described above as is evidenced by the admission in the United States District Court that the Tri-Belt infringed the Chapman-Dunlap and Tobin patents.

The desired result of holding freight in position in freight cars is accomplished with the loader, by the use of a cross bar to engage and hold the freight. At each end of the bar is located a bar head, used to attach and secure

the bar to the supporting wall members. One of the bar heads is freely telescopic in relation to the bar body, to allow for motion of the car walls without dropping the load. The bar heads are attached to the wall members, or belt rails, by three pins. These pins are inserted into the holes in the belt rail, with the center pin of the three serving as a latch. The two outside pins are load-bearing pins and are parallel. The pins of the Sparton Tri-Belt Loader are mounted eccentrically on the bar head, thus permitting pitch splitting: that is, fine adjustments of the bar, by rotating the bar about its longitudinal axis.

The receiving holes in the wall members are arranged in three horizontally disposed rows, the distance between adjacent holes in each row being equal to the distance between rows. The spacing of the load-bearing pins is equal to twice the distance between rows and between holes in each row. Therefore, the bar head may be inserted in a single horizontal row, or aligned vertically in holes in each of the three rows.

In use, movement of the bar head transverse and vertical to the length of the bar is precluded by load-bearing pins; and movement parallel to the length of the bar is prevented by a latch pin.

Appellant Sparton contends that the trial judge did not apply the correct standard of invention to test the validity of the three patents involved here. The applicable standard is set forth in Title 35, section 103, U. S. C. A., which states: "A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a per-

son having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made."

In considering the validity of the patents here in question, the trial judge made detailed inquiries and comparisons regarding the prior art in relation to each of the patents in suit. This court has done the same and is of strong opinion that those patents urged by appellant as having made the Nampa, Chapman-Dunlap and Tobin patents obvious to one of ordinary skill in the art, thereby rendering the three patents in suit invalid, clearly do not accomplish that result. The findings by the trial judge on this matter are well reasoned and supported by the evidence in the case; and his finding that none of the three patents in suit would have been obvious to one of ordinary skill in the art as a result of the prior art cited by the appellant will not be disturbed.

In arguinng that the patents in suit are invalid because all claims of the patents are those which call for structures previously used in the freight-bracing art and therefore are invalid under the rule of exhausted combination, appellant Sparton relies entirely on the authority of *Lincoln Engineering Co. v. Stewart-Warner Corp.*, 303 U. S. 545. The crux of the *Lincoln Engineering* case is the principle that where one develops a combination in which all the elements are known in the art and the only invention involved is that of a better component contained in the combination, one cannot claim the entire combination. While an individual component might have the required inventiveness, the inclusion of such patentable component does not make the entire combination patentable as such. To allow the applicant to claim the entire combination would be to allow him to claim more than he invented, which, of course, would be repugnant to the entire purpose of the patent system.

There is no argument with the holding of the court in *Lincoln Engineering* case. The only question concerning the principle stated therein is whether or not it has proper application in the case at bar.

It is true that a single patentable component will not made an entire combination of old elements patentable, but it has long been held in this circuit that a new combination of old elements, resulting in a new method of operation, is patentable as a combination. *Ferro Concrete Const. Co. v. Concrete Steel Co., et al.*, 206 Fed. 666 (C. A. 6); *Proudfit Loose Leaf Co., et al. v. Kalamazoo Loose Leaf Binder Co.*, 230 Fed. 120 (C. A. 6); *Ohio Rake Co. v. Bucher & Gibbs Plow Co.*, 266 Fed. 891 (C. A. 6); *Michigan Carton Co. v. Sutherland Paper Co. et al.*, 29 F. (2d) 179 (C. A. 6); *Cold Metal Process Co. v. Republic Steel Corp.*, 233 F. (2d) 828 (C. A. 6).

It is also true that the components constituting the patents in suit were known earlier in the freight-bracing art. Speaking broadly, the components are the bars, the bar heads and the wall members attached to the car. Patentability of combinations of old elements may be found when the elements co-act to produce a new result by a new method of operation. As we said in *Cold Metal Process Co. v. Republic Steel Corporation*, 233 F. (2d) 828, at page 936: "The controlling question is whether this combination has a new method of operation, and whether the new and useful results were obtained in a manner which was or was not obvious to persons of ordinary skill in the art. *American Chain & Cable Co., Inc. v. Rochester Ropes, Inc.*, 4 Cir., 199 F. (2d) 325."

In the Nampa patent is found, for the first time in the freight-bracing art, the feature of telescopic heads that co-act with the bars and wall members to produce a freight

bracing device to alleviate the dropping of the goods in transit. This constitutes a new method of operation that meets the test set forth in the *Cold Metal Process* case, *supra*.

In the Tobin patent, we find the pitch-splitting feature. This also achieves a new result in the freight loading field. By combining this new feature with the known elements of the art, a new result was achieved—that is, a new and easy method of snubbing up the freight which, before, had not been possible to such degree without the use of extra wedges, etc.

One of the problems in designing a freight dunnage system, to be installed permanently in the freight car, is the provision for flexibility and versatility in positioning of the freight-holding bars. Any given freight car will carry vastly different loads from time to time, each requiring a different placement of the bars adequately to secure the goods in transit. Although the Nampa and the Tobin systems permitted some adjustment in the general placing of the bars, the Chapman-Dunlap system goes farther; and, by arrangement of the three-hole wall-member system, provides great flexibility in the possible location of the bar. The three equally spaced holes in each wall member, combined with the two-load-bearing pins and the latch pin on the bar head, enable the bar to be placed in a variety of positions and heights. The co-action of the three-hole wall-member system with the other elements of the system results in a new effect not before achieved in this field, thereby meeting the test of the *Cold Metal Process* case.

The question of whether or not the courts should decide the validity or invalidity of patents in suit, when no in-

fringement has been found, often has been presented to this court. *Landis Machinery v. Chaso*, 141 F. (2d) 800 (C. A. 6); *Pennington Engineering Co. v. Spicer Mfg. Corporation*, 165 F. (2d) 59 (C. A. 6); *Dow Chemical Company v. Skinner*, 197 F. (2d) 807 (C. A. 6); *Whitman, et al. v. Andrus*, 194 F. (2d) 279 (C. A. 6); *Thabet Mfg. Co. v. Kool Vent Metal Awning Corp. of America*, 226 F. (2d) 207 (C. A. 6).

In the *Thabet* case, the patent in issue had expired before this court had presented to it the question of whether to consider validity after a finding of non-infringement. The court there stated [226 F. (2d) 207, 211]: "In view of that fact [the expiration of the patent] and our ruling against infringement, we find it unnecessary to rule on the question of the validity of the patent in issue." The court then cited the *Dow Chemical* case and the *Landis Machinery* case. In the *Dow Chemical* case, the patent had also expired, so the question of validity was deemed moot and a ruling on validity was consequently not to be required. However, in the *Dow* opinion, the court quoted from *Sinclair Company v. Interchemical Corporation*, 325 U. S. 327, 330: "There has been a tendency among the lower federal courts in infringement suits to dispose of them where possible on the ground of non-infringement without going into the question of validity of the patent. * * * It has come to be recognized, however, that of the two questions, validity has the greter public importance. *Cover v. Schwartz*, 2 Cir., 133 F. (2d) 541, and the District Court in this case followed what will usually be the better practice by inquiring fully into the validity of this patent."

It was thus seemingly left to the discretion of the lower court to determine whether decision on the question of validity was required. This court reasoned that the use of

the word "usually" by the Supreme Court in the *Sinclair* case gave discretion to the low r court. This reasoning was strengthened by the fact that two earlier cases decided by the highest court [*Electrical Fittings Corp. v. Thomas & Betts Co.*, 307 U. S. 241, and *Altvater v. Freeman*, 319 U. S. 359] were not cited in *Sinclair*. In those cases, the holding was that, where there was non-infringement, validity should not be adjudicated.

The trial court here had before it the consideration of three patents, two of which were conceded to be infringed. All three involved freight dunnage; and the device alleged to infringe the patents in suit was also a freight-dunnage system. In such posture, we think the best policy was for the District Court to consider the question of validity of Nampa, even thought it was found that the patent had not been infringed. Inasmuch as the three patents and the alleged infringing device were all of similar nature, it would not seem reasonable to require the trial court to decide the issue of validity of two of the patents and to leave the third undecided. The appellant was successful in proving non-infringement of the Nampa patent. Why should it now contest the finding of validity, unless for some undisclosed reason, it is interested in the validity of the Nampa patent? If the corporation does have a rightful interest in the patent's validity, it would seem better to have the question decided as it was, rather than to instigate another action to try an issue so closely interwoven with the present case. It does not appear that the appellant was in any manner prejudiced by the decision concerning validity. Thus, it was in keeping with the public-policy statement in the *Sinclair Company* case, *supra*, for the District Court to decide the issue of validity.

It is contended by appellant that the Nampa and the Chapman-Dunlap patents are invalid because structures

conforming to the disclosures of those patents were in public use and offered for sale more than one year prior to the application for the patents.

This contention raises an issue of fact. On this point, the trial judge made detailed and specific findings of fact to the effect that neither the Nampa nor the Chapman-Dunlap patent is invalid because of public use or of being offered for sale more than one year prior to the application for the respective patents. A careful examination has been made of the findings of fact of the District Court and of the evidence supporting such findings. We are of opinion that, on this factual matter, the findings of the trial court are amply supported by substantial evidence and are not clearly erroneous. Therefore, the finding of the District Court, that there was no public use or offer of sale of the patents more than one year prior to the applications therefor, will stand.

The argument has been advanced that the District Court did not apply the correct legal standard of employee liability, in deciding that Robert Schroeder was wrong in taking his freight-bracing system to the Sparton Corporation rather than carrying it back to Evans Products Company, his former employer. In support of this argument, appellant cites *Bickley, et al. v. Frutchey Bean Co.*, 279 F. (2d) 685 (C. A. 6). That case was an action for alleged disclosure of trade secrets and was originally brought *ex contractu* as a common law action. The contract aspect was dropped; and the case proceeded to judgment on the common law action. We do not see the relevancy of the *Bickley* case here.

The important matters under consideration in the present controversy are the validity of three Evans-owned patents and the question of whether or not these patents are

infringed. Infringement is admitted in the case of the Chapman-Dunlap and Tobin patents; and the court found non-infringement of the Nampa patent. Therefore, the actions of Robert Schroeder are unimportant in considering the question of infringement. As to the validity of the three patents in suit, we fail to see how the conduct of Schroeder would have any influence at all on ultimate determination of the matter.

In pondering the validity of the three patents in suit, we have considered the prior art, the presence of invention, the public use or sale more than one year prior to the time of application for the patent, and other pertinent factors. But whether an employee of the owner of the three patents in issue disclosed certain information, which may or may not have resulted in development of an infringing device by a competitor, would have no bearing on the validity of the three patents owned by his former employer. It is urged that the fact of Schroeder's having been a former Evans employee, who made certain disclosures to Sparton, was kept constantly before the court, but that the court should not have been influenced thereby. This argument must fail, for there is no showing that the trial court, in determination of the case, was actually influenced by the actions of Schroeder.

The validity of the Chapman-Dunlap patent is attacked on the ground that certain amendments thereto amount to an introduction of new matter. The amendment challenged is that of changing the word "is" to "may be" in line 29, column 8, of Patent No. 2,834,304. The change relates to the telescopic features of the freight-holding bars. Sparton contends that, as originally stated, the word "is" conveyed the implication that the locking pin would be positioned in the bar, thereby locking it into position; and that it was only after the amendment (changing "is" to "may be")

that the telescopic feature could be claimed. We think that the rule applicable to this situation was stated by this court in *Coats Loaders & Stackers, Inc. v. Henderson*, 223 F. (2d) 915 (C. A. 6).

Appellant Sparton has attempted to bring the presently questioned amendments within the doctrine reiterated in *Muncie Gear Works v. Outboard Marine and Manufacturing Co.*, 315 U. S. 759: that an application for a patent cannot be broadened by amendment to embrace an invention not disclosed in the application as filed, when adverse rights of the public have intervened. Here, as was stated by Mr. Justice Stewart (then a member of this court) in the *Coats Loaders* case, supra: "The ultimate question is: was the invention which is now claimed disclosed in the original application, or was it not disclosed until the amendment. * * *"

In our opinion, the telescopic nature of the freight-holding bars was disclosed in the original application. Mention of the telescopic feature was made in the application in lines 20-21, page 8; in lines 7 and 14, page 16; and in line 6, page 19. The mention at these places, coupled with the detailed drawing showing the telescopinng character of the bars, constitutes ample disclosure upon which the subsequent amendments could rest.

With reference to the Tobin patent, the amendment which Sparton contends to be violative of the spirit of the *Muncie Gear* case involved the feature known as "pitch splitting. Pitch splitting is rotational variation of the position of the freight-holding bar in relation to the freight, so as to take up any space that would allow small movements of the cargo. This is accomplished in the Tobin patent by the eccentric location of the load-bearing pins, which attach the bar to the wall member. The original application did not expressly use the term "pitch splitting"

but it did state: "It will be seen that the two pins 17 are eccentric with respect to the center line of the bar 61. Various spacings can therefore be obtained by turning the bar about its center line." This language would seem to be a clear disclosure of the practice known as "pitch splitting," for it describes exactly what is done when pitch splitting is used to secure freight: that is, the bar is turned, presenting various spacings in relation to the freight and thereby allowing fine adjustments to be made in securing the freight in position.

By cross-appeal, Evans Corporation challenges the finding of the District Court that the Nampa patent was not infringed by the Sparton Tri-Belt Loader. The Tri-Belt Loader and the Nampa system were intended to accomplish the same result: to hold freight in position in freight cars to prevent damage in transit and yard operations. Observation of the two systems in question reveals at once differences in construction, design and method of operation.

The Sparton Tri-Belt depends upon two parallel pins to take the load of the freight, while the Nampa system utilizes two intermeshing rows of projections (much like saw teeth) to hold the load and prevent movement. To latch the bar to the wall member, the Sparton Loader uses a third pin, adapted to latch the bar to the wall member and prevent disengagement. This securing is accomplished in the Nampa mechanism by a cam-like lock that fits under the smooth edge of the serrated wall member, pulling the projections of the bar head down securely into the matching serrations of the wall member. The member is thereby prevented from vertical and transverse movement in relation to the bar.

To hinder movement parallel to the length of the bar, the Nampa apparatus contains a lip, extending from the head member of the bar, which fits over the wall member and secures the bar. In the Tri-Belt Loader, both vertical

and horizontal movement is prevented by the center pin which is shaped so as to function as a latch. Also, by arrangement of the holes in the wall members into which the load-bearing and locking pins of the bar head fit, the Sparton equipment enables the loaders to rotate the bar so as to achieve various bar settings in relation to the freight. This allows four degrees of pitch splitting, or fine adjustment of the bar against the freight, by rotation of the bar about its longitudinal axis. This pitch-splitting feature is not found on the Nampa equipment.

A careful examination of the actual bar heads and wall members in question, along with the detailed drawings and specifications of the equipment here questioned, leads us to the conclusion that the United States District Court was correct in finding that the Sparton Tri-Belt Loader did not infringe Nampa patent, No. 2,679,214.

For the foregoing reasons, the judgment of the District Court is, in all respects, affirmed.

JUDGMENT OF COURT OF APPEALS

August 30, 1961

Appeal from the United States District Court for the Eastern District of Michigan.

This Cause came on to be heard on the transcript of the record from the United States District Court for the Eastern District of Michigan, and was argued by counsel.

On Consideration Whereof, It is now here ordered and adjudged by this Court that the judgment of the said District Court in this cause be and the same is hereby affirmed.

Approved for entry:

/s/ John D. Martin,
United States Circuit Judge.

Jan. 7, 1941. W. L. THOMAS 2,227,870

RAILWAY CAR AND METHOD OF LOADING THE SAME

Filed May 4, 1938 5 Sheets-Sheet 1

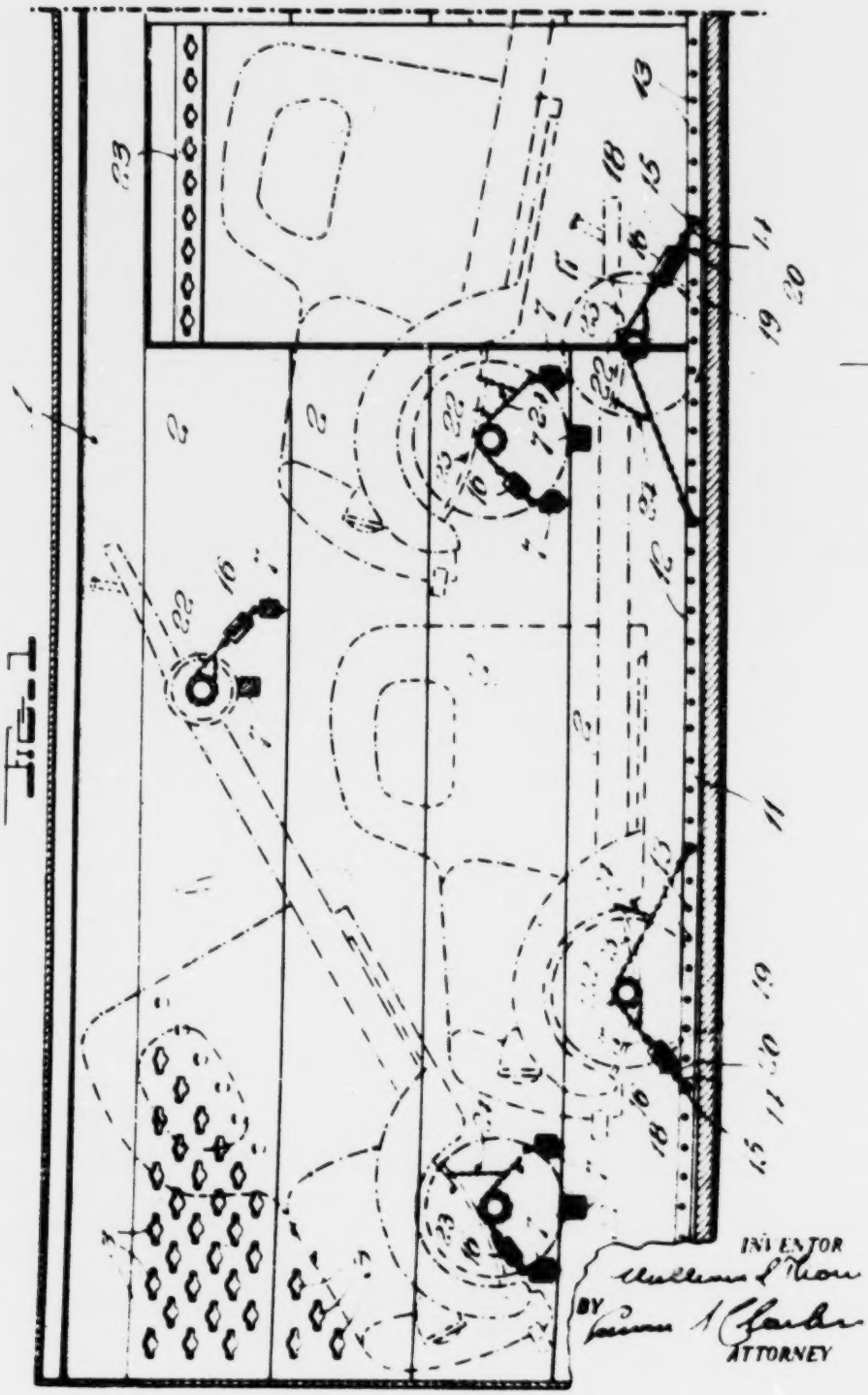


Fig. 1

INVENTOR
William L. Thomas
BY
James A. Clarke
ATTORNEY

Jan. 7, 1941. W. L. THOMAS 2,227,870

RAILWAY CAR AND METHOD OF LOADING THE SAME

Filed May 4, 1938 5 Sheets-Sheet 2

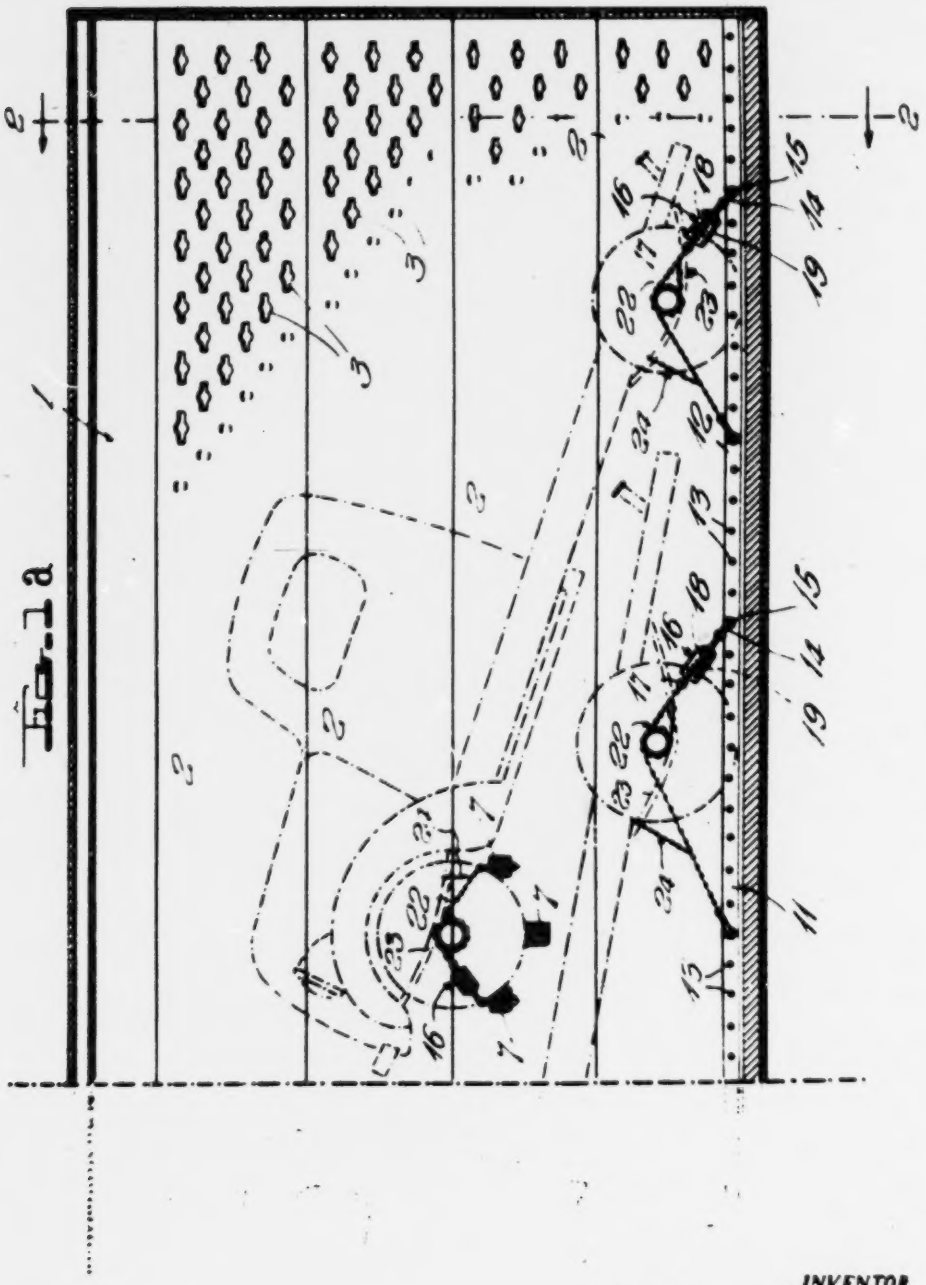


Fig. 1a

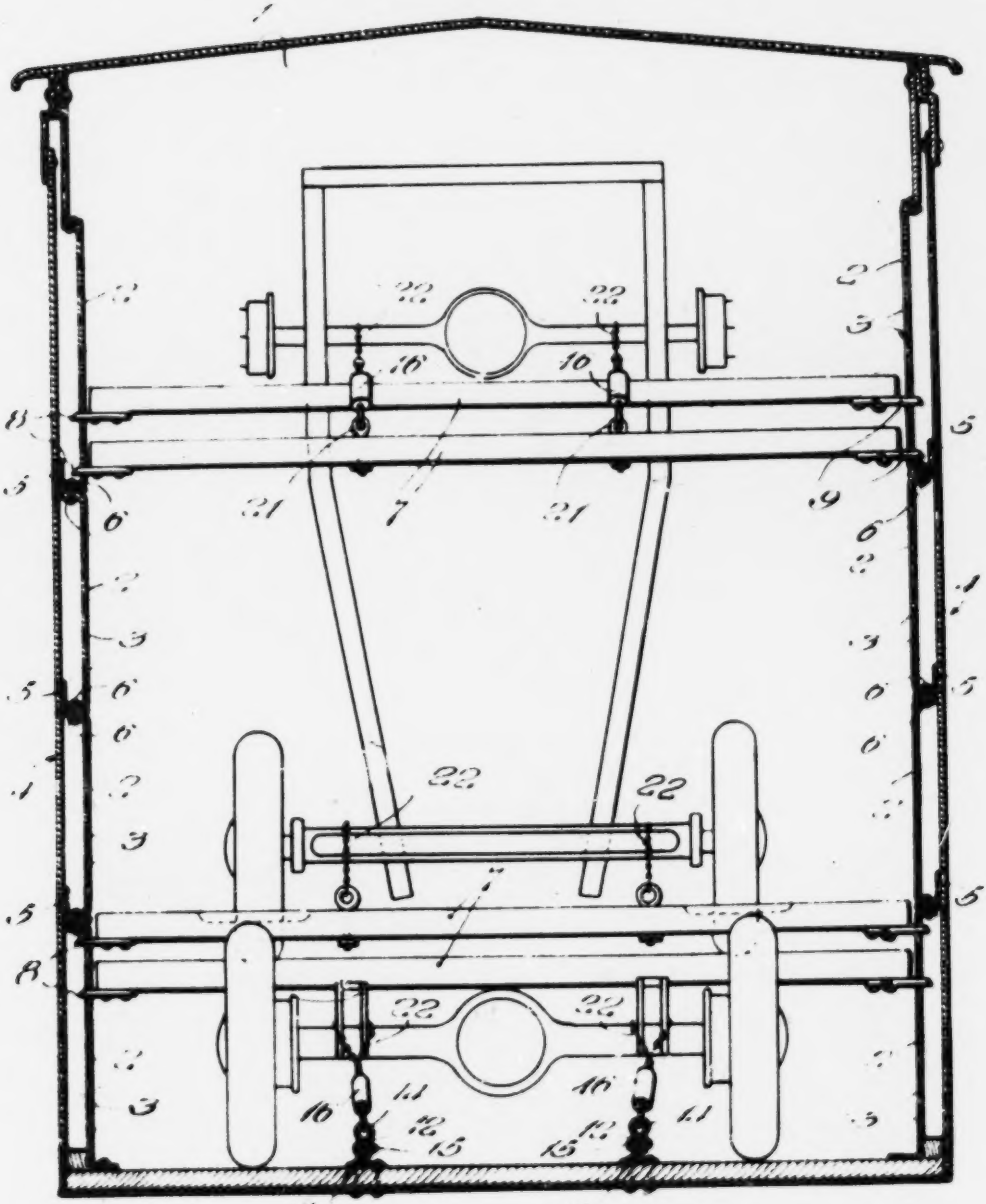
INVENTOR
William L. Thomas
BY James L. Clarke
ATTORNEY

Jan. 7, 1941. W. L. THOMAS 2,227,870

RAILWAY CAR AND METHOD OF LOADING THE SAME

Filed May 4, 1938 5 Sheets-Sheet 3

Fig. 2

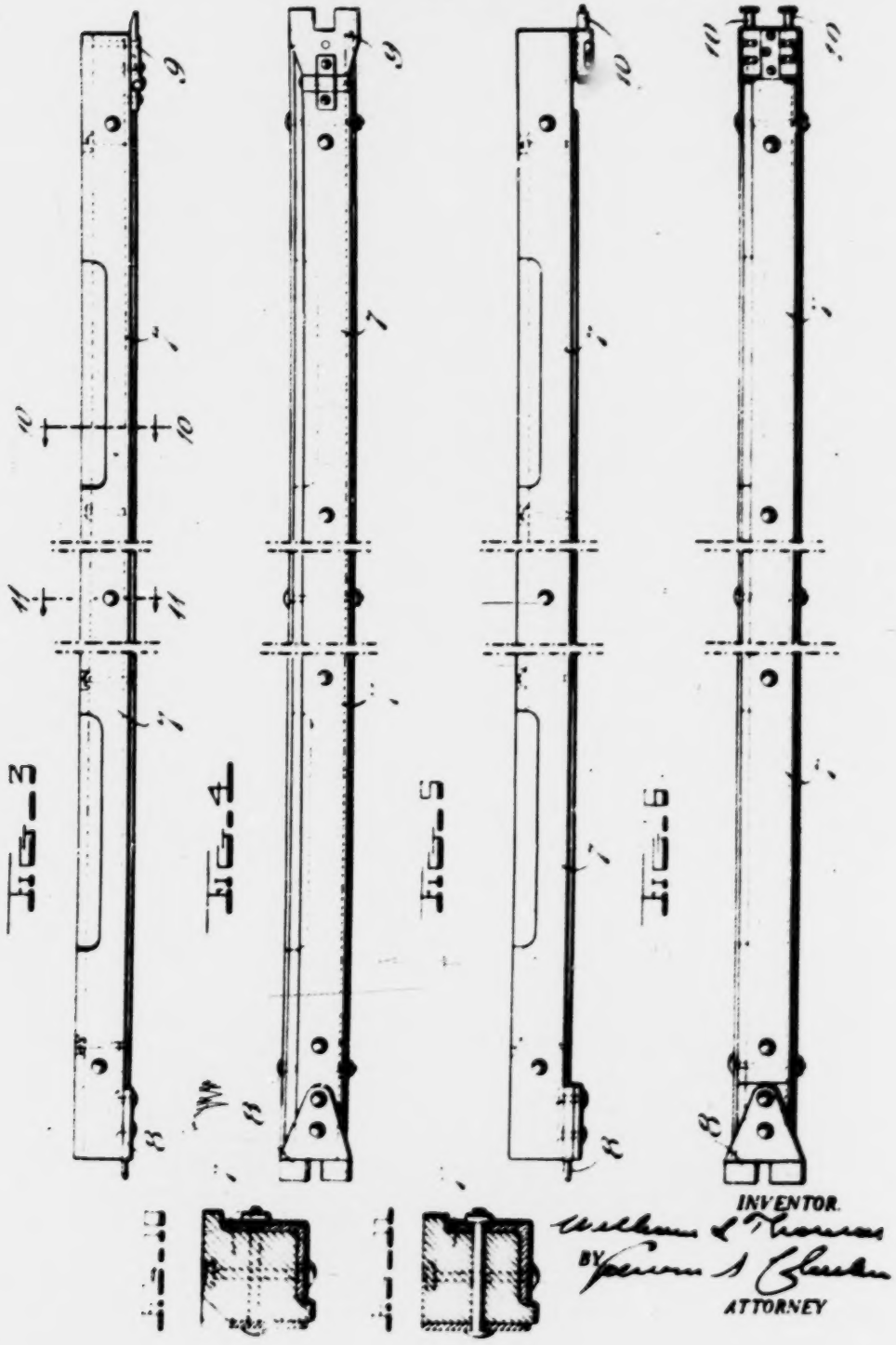


INVENTOR
W. L. Thomas
BY
Parmele & Clarkson
ATTORNEY

Jan. 7, 1941. W. L. THOMAS 2,227,870

RAILWAY CAR AND METHOD OF LOADING THE SAME

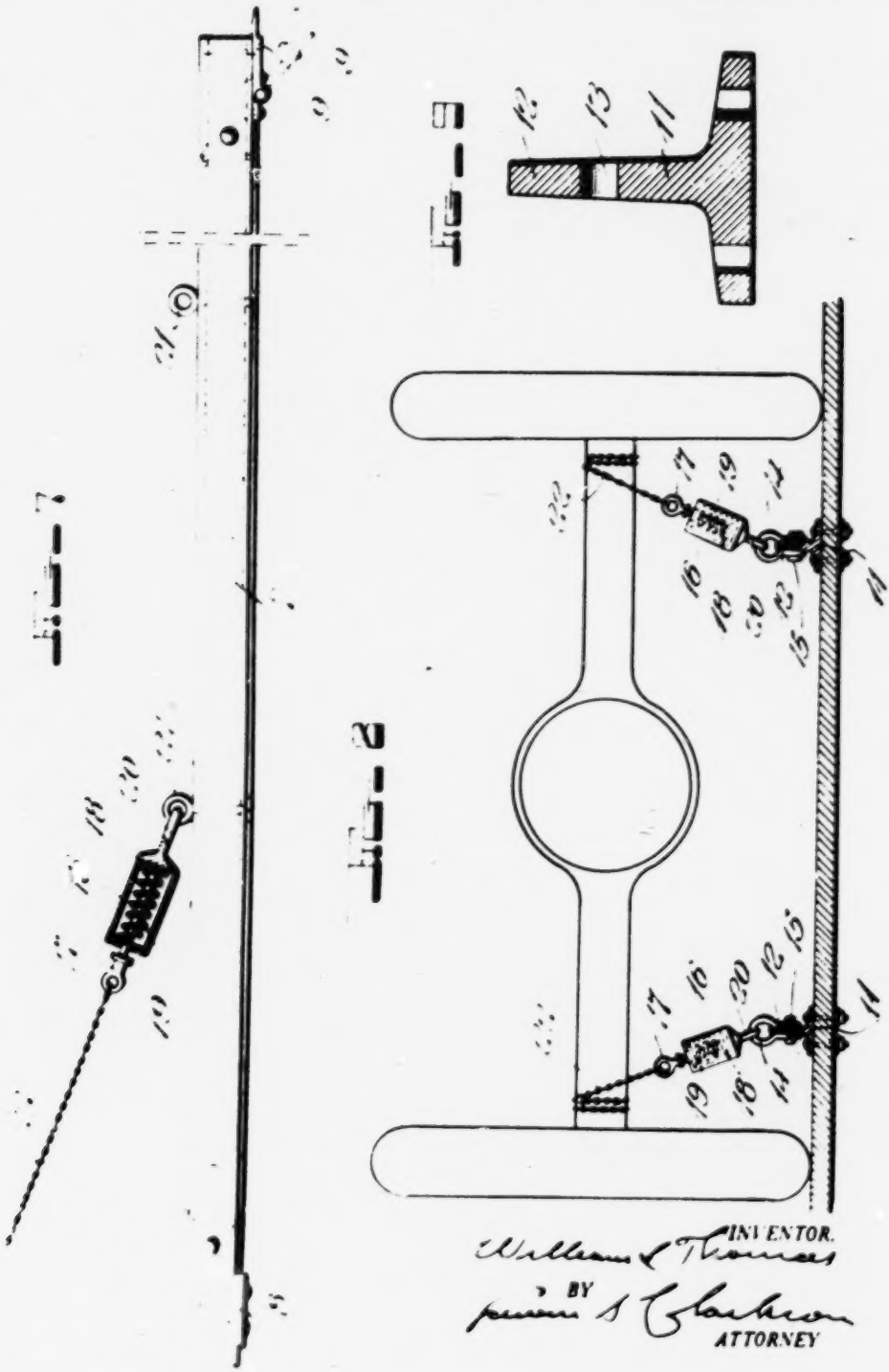
Filed May 4, 1938 5 Sheets-Sheet 4



Jan. 7, 1941. **W. L. THOMAS** **2,227,870**

RAILWAY CAR AND METHOD OF LOADING THE SAME

Filed May 4, 1938 5 Sheets-Sheet 5



William L. Thomas INVENTOR.

BY

James S. Clarkson

ATTORNEY

Patented Jan. 7, 1941

2,227,870

UNITED STATES PATENT OFFICE

2,227,870

RAILWAY CAR AND METHOD OF LOADING THE SAME

William L. Thomas, Haverstraw, N. Y., assignor to The New York Central Railroad Company, a corporation of New York

Application May 4, 1938, Serial No. 206,846

1 Claim. (Cl. 105—368)

While my invention relates to railway cars in general, it relates more specifically to railway cars adapted for shipping automobiles, automobile trucks, et cetera.

The primary object of my invention is to provide a satisfactory car equipment for handling the shipment of trucks by rail in lieu of the present practice under which a major portion of deliveries are made by highway (drive away), and in carrying out the object of my invention I have availed myself of the perforated inner car wall structure and cross members disclosed in the Thomas Patents Nos. 2,030,773 and 2,038,892.

Another object of my invention is to position the trucks in the railway car in nested and overlapped relation to each other to store a maximum number of trucks in a car.

Another object of my invention is to provide means for holding the trucks in position in the car to prevent them from moving or shifting while in transit; and with these, and other objects in view, my invention consists of the parts and combination of parts hereinafter set forth.

In the drawings:

Figures 1 and 1a denote a vertical longitudinal section through a freight car embodying my invention.

Figure 2 is a section on line 2—2 of Figure 1a showing a plurality of trucks in loaded position in the car.

Figure 3 is a side elevation of one of the cross members.

Figure 4 is a bottom plan view of Figure 3.

Figure 5 is a side elevation of another form of cross member.

Figure 6 is a bottom plan view of Figure 5.

Figure 7 is a side elevation of a cross member and one of the hold down devices.

Figure 8 is an enlarged elevation of the hold down device, anchoring rail with the hold down device connected to the rail and a portion of a truck.

Figure 9 is a detail transverse sectional view of the rail.

Figure 10 is a transverse vertical section on the line 10—10 of Figure 3.

Figure 11 is a transverse vertical section on the line 11—11 of Figure 3.

The reference numeral 1 designates a railway house or box car of any approved construction, the interior side walls of which are provided with perforated strips, or sheets, of metal 2, the perforations 3 preferably being elongated. These perforated strips or plates are spaced from the outer wall of the car by side posts or in any other desired manner. However, in the present instance I affix to the outer wall 4 angles 5, and provide the perforated sheets with inturned flanges 6 which are riveted to said angles 5 as best seen in Figure 2. These perforations, as described in the Thomas Patent No. 2,030,773, dated February 11, 1936, extend in staggered vertical and horizontal rows, and no claim is made herein to such perforated sheets or strips per se.

Cross members 7 of suitable construction, preferably having at one end stationary projections 8, and adjustable projections 9 at the other end, are used as transverse supports in the car, the projections 8 and 9 being adapted to interlock with the perforations 3 of the inner walls of the car. In Figures 3 and 4 the adjustable lock 9 comprises a plate hinged to one end of the supporting member, while in Figures 5 and 6 the adjustable member comprises two bolts 10. The attachment and detachment of these cross members 7 is obvious and is fully disclosed in the said Thomas patents.

The car has a large end door through which the trucks are loaded. On the floor of the car I secure rails 11 having upstanding webs 12 which are provided with perforations 13. A clevis 14 is pivotally secured to the web 12 of the rail 11 by means of a bolt or other suitable device 15, as more clearly shown in Figure 8. The web 12 is provided with a row of these perforations 13 throughout its length, as shown in Figure 1. These rails 11 may be continuous throughout the length of the car, or they may be in detached sections as found most advantageous in practice.

Hold down members comprising a cylinder 16, plunger 17 carrying a head 18 within the cylinder and a coiled spring 19, are employed to hold down trucks loaded in the car, as will be hereinafter described. The cylinder 16 is provided with an extension 20 which is secured to the clevis 14 (see Figure 2). When these hold down members are used in connection with the cross members 7 the extension 20 is secured to the eye bolt 21 secured to the cross member. A tie chain, or other suitable tie down, 22 is secured at one end to the plunger rod 17, the free end thereof being adapted to be secured to the truck.

Referring now to Figure 1 in preparing the car to receive the first truck (at the left of the figure) cross-members 7 are secured in position to the perforated side sheets of the car. The spac-

ing of these crossmembers is determined by the diameter of the wheels on the truck as will be readily understood. In the present instance two (front and rear) bars arranged at the same level are disposed in connection with an intermediate bar to form a cradle to receive the front wheels of the truck. The front end of the truck is now elevated by any suitable means and the front wheels seated in the cradle formed by the crossmembers 7. The said end of the truck is now tied by the chains 22 to crossmember, or crossmembers 7, as shown. The opposite or rear end of the truck is then elevated, by any suitable means, and a crossmember, or crossmembers 7 are placed in position under the wheels, as shown, after which the end of the truck is tied in position to another crossmember, or crossmembers 7 by means of the chain 22. The second truck is rolled along the floor of the car to the position shown in Figure 1 underneath the first truck and is tied at each end by means of the chain tie-down device to the rails 11, as shown. The third truck is raised at one end and through its wheels rests seated in another cradle formed by crossmembers 7 slightly forward of the wheels of the second truck and a comparatively short distance above the second truck. The opposite end of the third truck is tied down to the rails 11 by means of the tie-down device heretofore described. The fourth truck is elevated at one end and its wheels are positioned and seated in a third cradle formed by crossmembers 7 above the chassis of the third truck, while its opposite end is secured to the rails 11 by the herein described tie-down, and so on until the car is fully loaded.

The equipment used for raising and lowering the trucks in decked position consists of portable runways and hoists (not shown) which would ordinarily be supplied by the shipper and consignee. No special provision for attachment of hoists appears, from actual experience, to be required, as in the loading and unloading; thus far it has been found that trucks can be raised and lowered readily by using runways and a portable hoist, each side, attached directly to the perforated wall of the car. However, specific means for the attachment of the hoists may be employed if found desirable.

The numerous rows of perforations, vertical and horisontal make it possible to position the cross members in any position that may be necessary to support an end of a truck irrespective of the length of the wheel base of the truck.

It will be noted that the cross supporting beams may be arranged in groups of two, three or four, or any other number as required.

In the event that it becomes necessary to place the cross beams 7 at a point that coincides with the side door ways I provide door way bars 23 which are provided with perforations like those in the wall sheets and in horizontal alignment with the perforations in the wall sheets. These door way bars may be secured in position after the manner shown in the said Thomas patents, or in any other approved manner.

To restrain the movement of the springs 23 of the truck while in transit in the car I extent the chain 24 attached at one end to the spring and at the other end to the main chain 22.

What I claim is:

In a vehicle transporting car having side wall sheets provided with horisontal and vertical rows of perforations, the perforations of the rows alternating in arrangement with each other, a set of spaced bars extending between the walls and having engaging members at their ends detachably engaged with perforations in the sheets for supporting and anchoring one end of a car, a set of spaced bars extending between the walls and having engaging members at their ends detachably engaged with perforations therein for supporting and anchoring the other end of the automobile, the bars of at least one set being arranged to form a concaved cradle to receive the wheels at one end of the vehicle and the bars of each set being interchangeably engageable with perforations of the rows for disposing said sets of bars and the bars of each set being also arranged at different horisontal and vertical positions relative to the car and to each other to suit different sizes of vehicles and to support vehicles horisontally or at different angles of inclination from the side walls, and anchoring means engaged with at least one bar of each set and with the adjacent end of the vehicle for fastening said end of the vehicle in supported position.

WILLIAM L. THOMAS.

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FREIGHT LOADING APPARATUS

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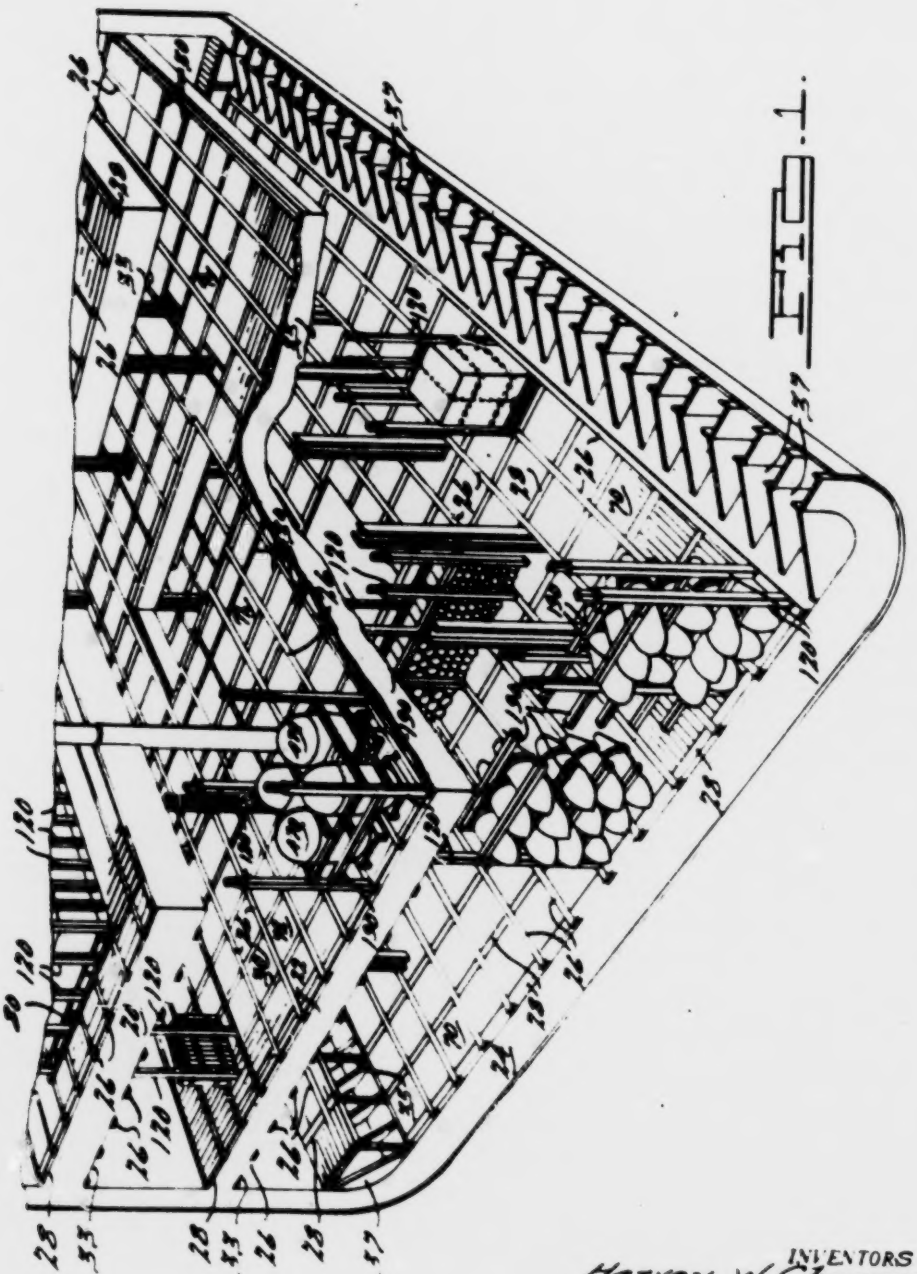

FIG. 1.

INVENTORS
Harvey W. Chapman
Henry L. Dunlap
BY
Harness, Dickey & Pierce
ATTORNEYS

May 13, 1958 H. W. CHAPMAN ET AL 2,834,304

FREIGHT LOADING APPARATUS

Filed Sept. 21, 1954 10 Sheets-Sheet 2

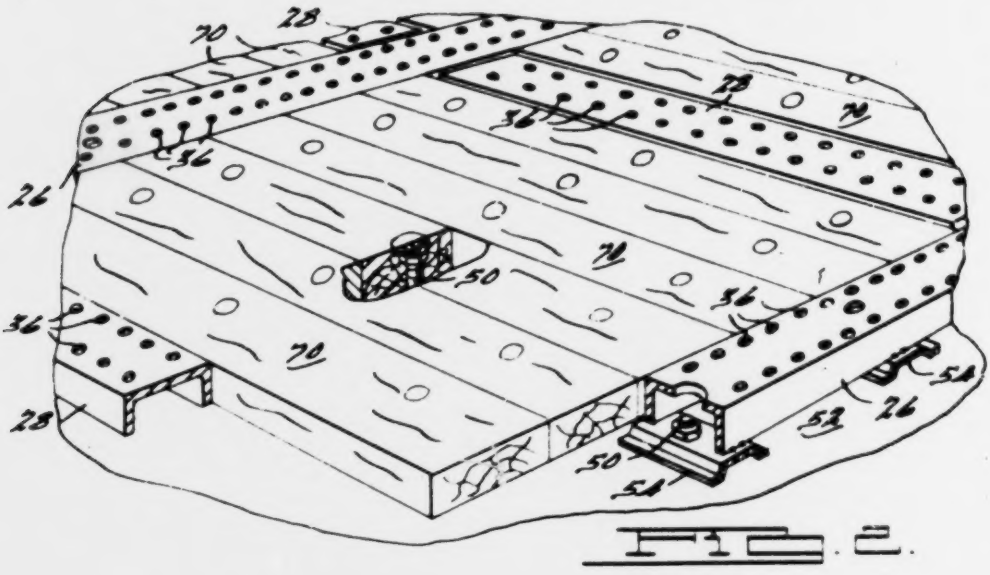

FIG. 2.

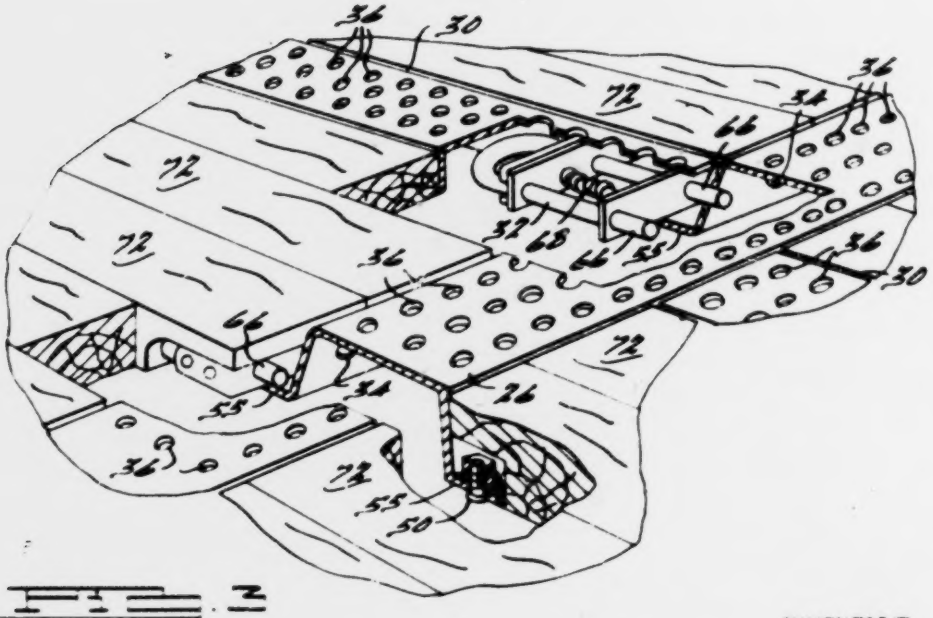

FIG. 3.

INVENTORS
Harvey W. Chapman
Henry L. Dunlap
BY
Harness, Dickey & Pierce
ATTORNEYS

May 13, 1958 H. W. CHAPMAN ET AL 2,834,304

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Filed Sept. 21, 1954 10 Sheets-Sheet 3

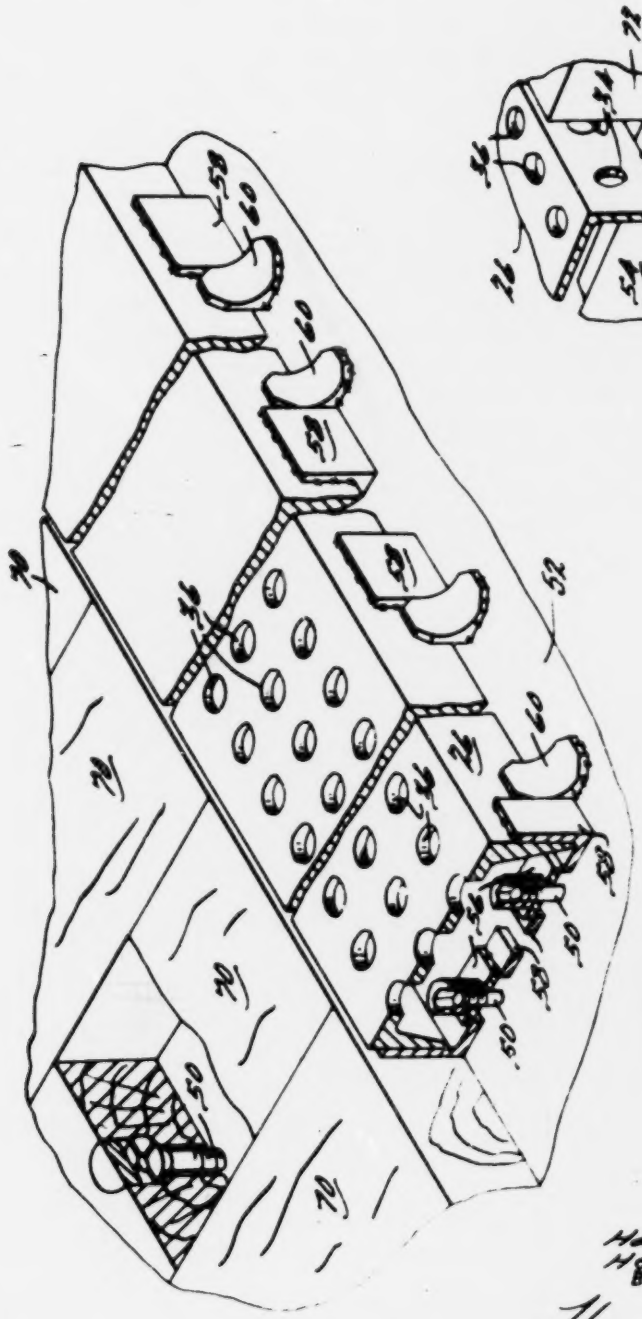

FIG. 4.

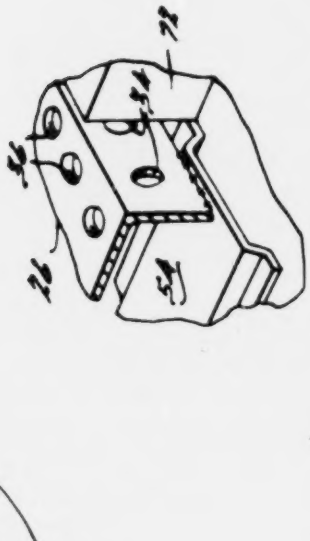

FIG. 4A.

INVENTORS
Harvey W. Chapman
Henry L. Dunlop
BY
Harness, Dickey & Pierce
ATTORNEYS

May 13, 1958 H. W. CHAPMAN ET AL 2,834,304

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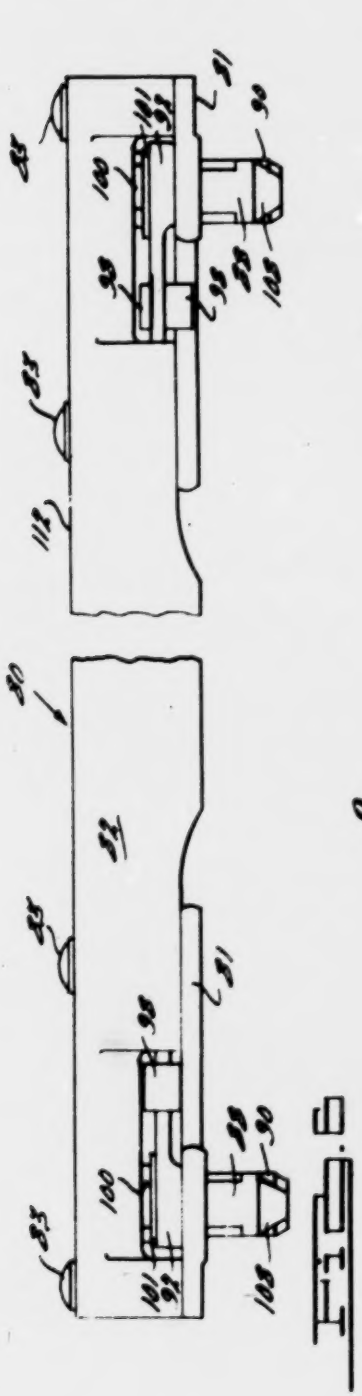

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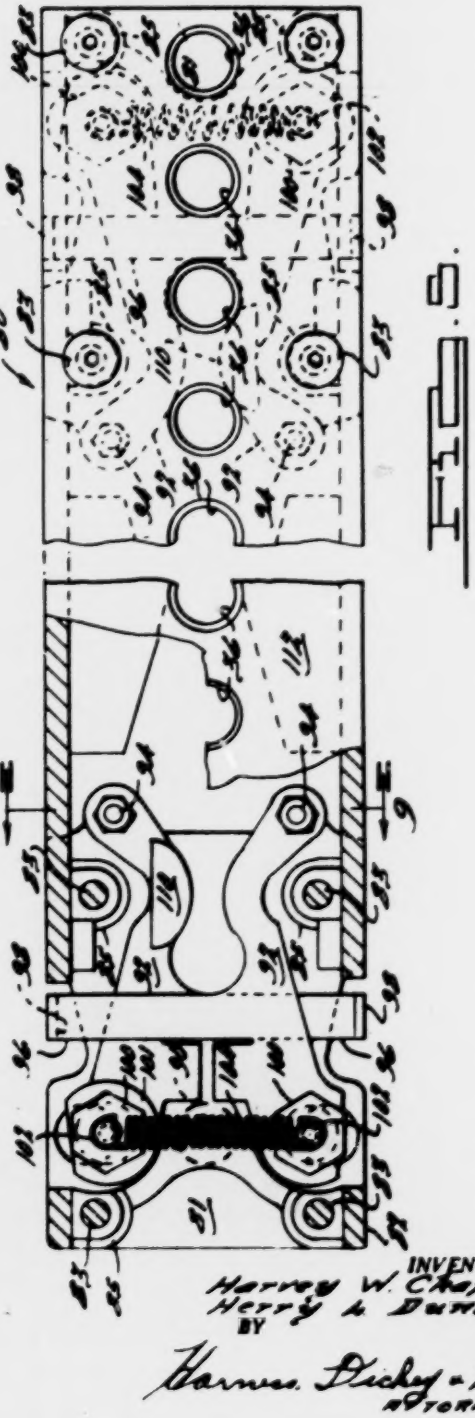

FIG. 5.

INVENTORS
Harvey W. Chapman
Harry L. Dunlop
BY
Harness, Dickey & Pierce
ATTORNEYS

May 13, 1958 H. W. CHAPMAN ET AL 2,834,304

FREIGHT LOADING APPARATUS

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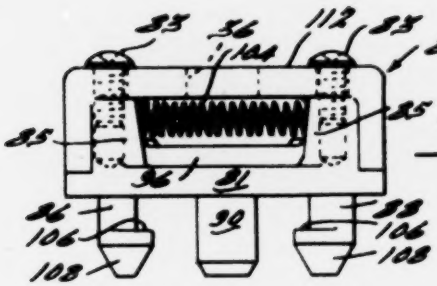


Fig. 8.

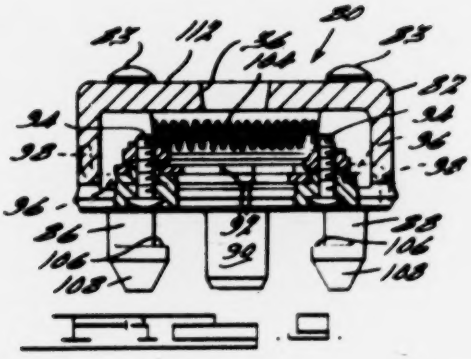
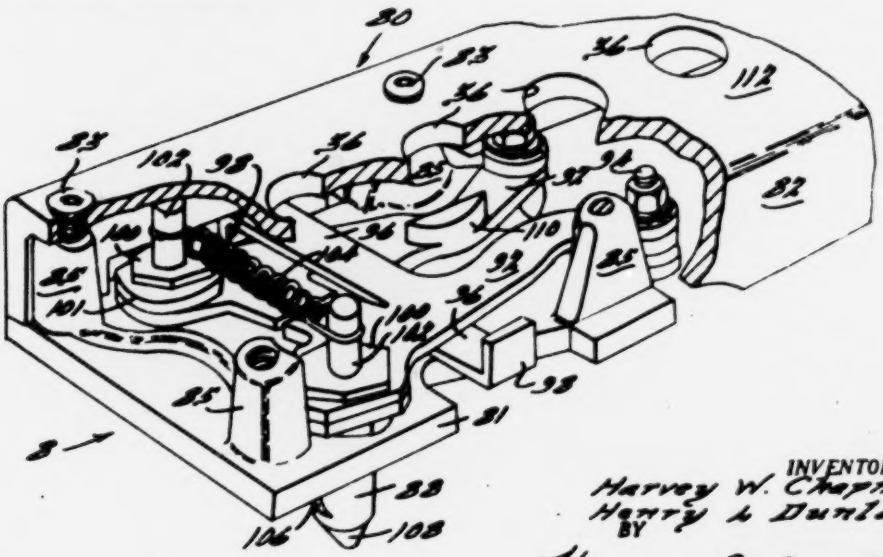


Fig. 9.

Fig. 7.



INVENTORS
Harvey W. Chapman
Henry L. Dunlap
BY

Harness, Dickey & Pierce
ATTORNEYS

May 13, 1958 H. W. CHAPMAN ET AL 2,834,304

FREIGHT LOADING APPARATUS

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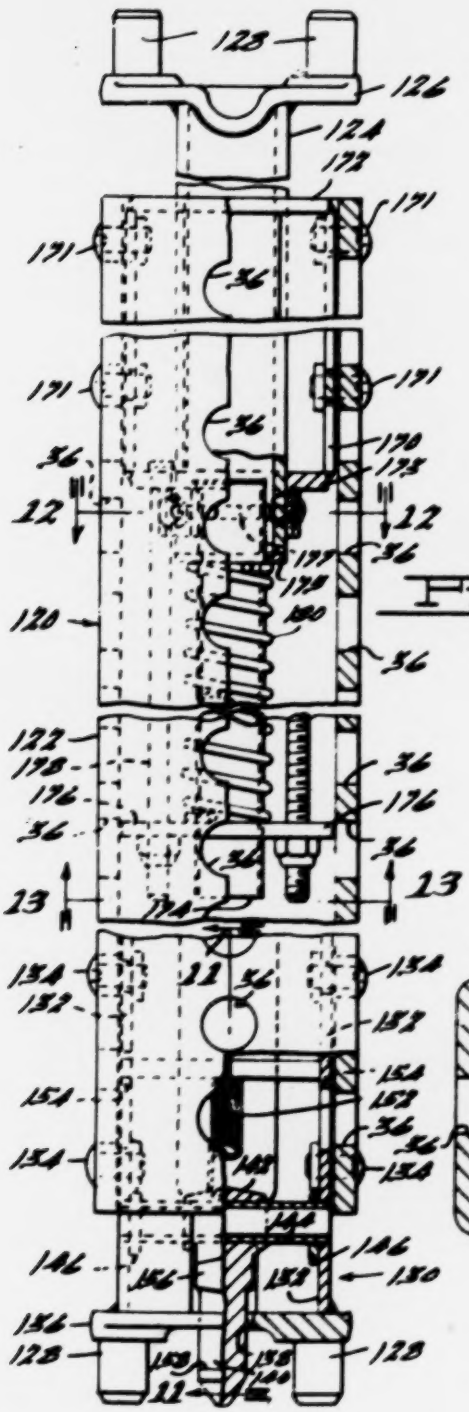


FIG. 10.

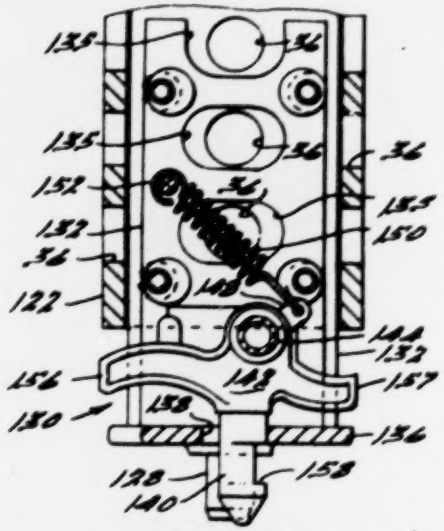
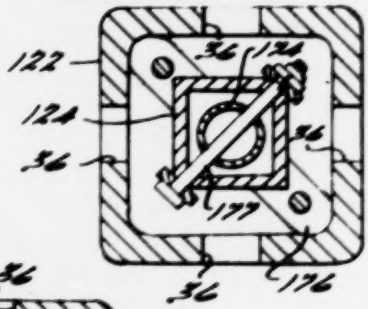


FIG. 11.

FIG. 12.



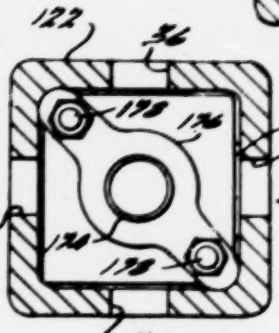


FIG. 13.

INVENTORS
Harvey W. Chapman
Henry L. Dunlap
BY
Harness, Dickey & Pierce
ATTORNEYS

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FREIGHT LOADING APPARATUS

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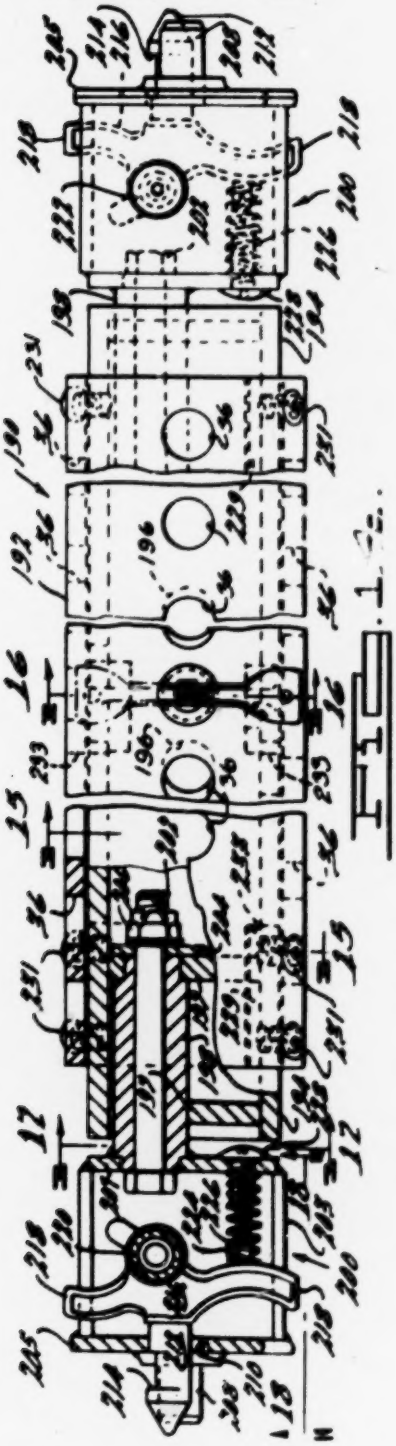

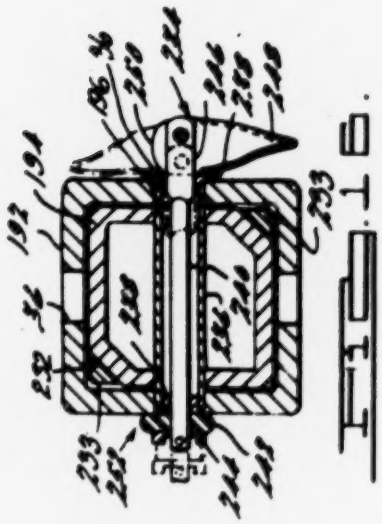

FIG. 16.

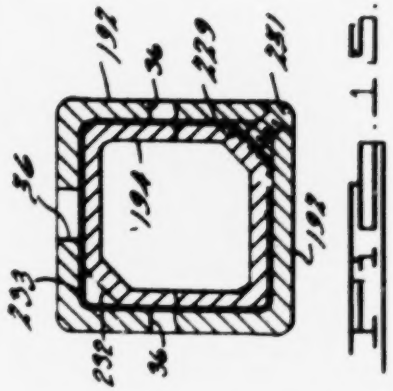

FIG. 15.

INVENTORS
Harvey W. Chapman
Henry L. Dunlap
BY

Harness, Dickey & Pierce
ATTORNEYS

May 13, 1958 H. W. CHAPMAN ET AL **2,834,304**

FREIGHT LOADING APPARATUS

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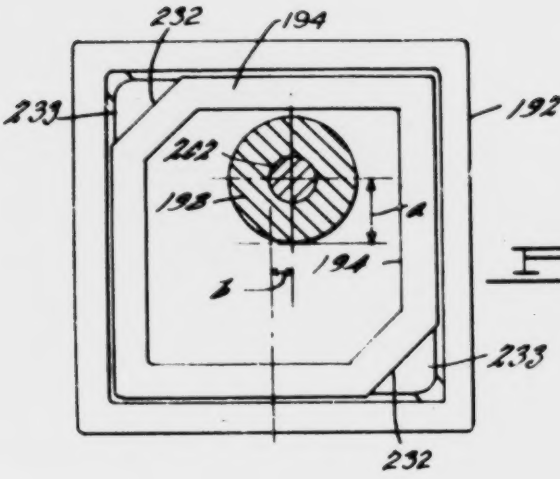

Fig. 12.

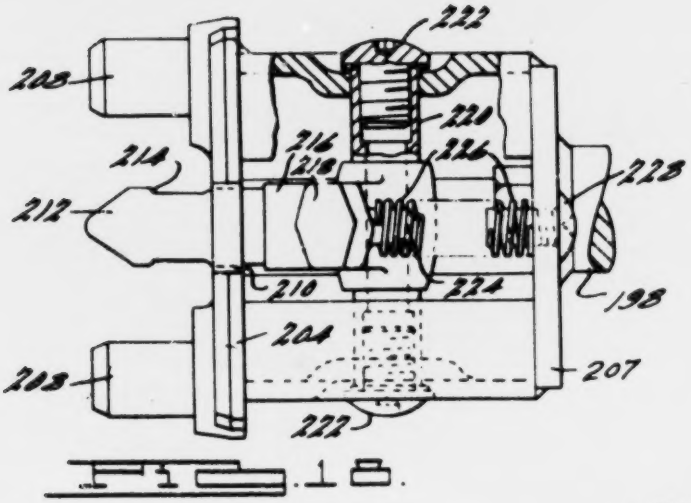

Fig. 13.

INVENTORS
Harvey W. Chapman
Henry L. Dunlap
BY
Harness, Dickey & Pierce
ATTORNEYS

May 13, 1958 **H. W. CHAPMAN ET AL** **2,834,304**

FREIGHT LOADING APPARATUS

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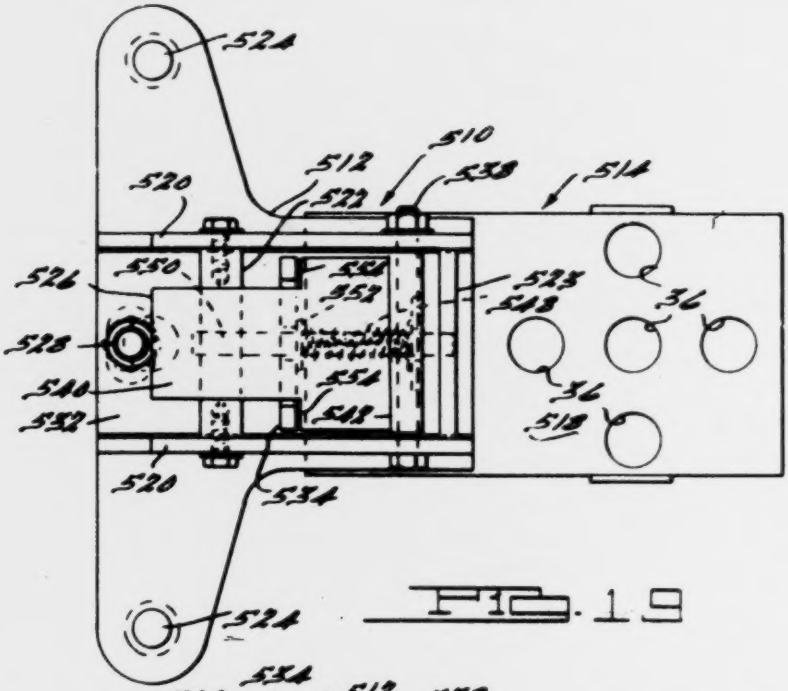

FIG. 19

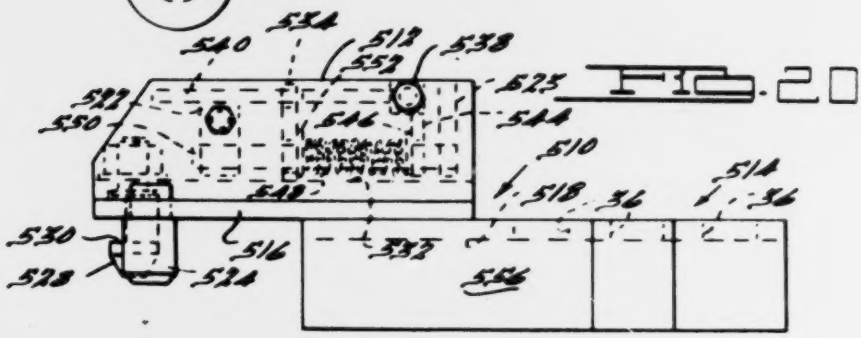

FIG. 20

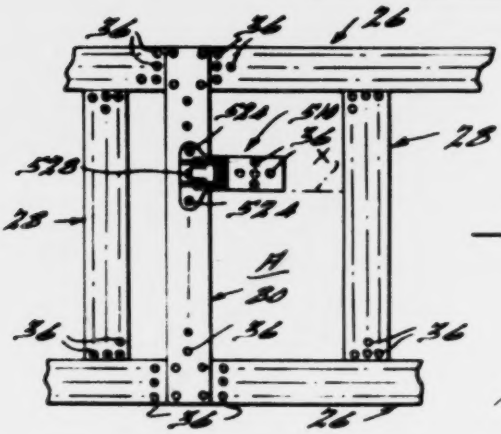

FIG. 21

INVENTORS
Harvey W. Chapman
Henry L. Dunlap
BY
Harness, Dickey & Pierce
ATTORNEYS

May 13, 1958 H. W. CHAPMAN ET AL **2,834,304**

FREIGHT LOADING APPARATUS

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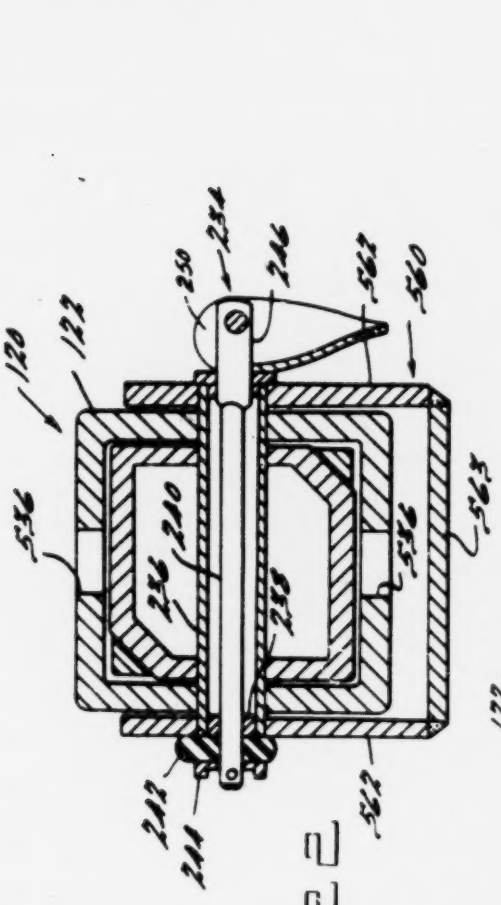

Fig. 2

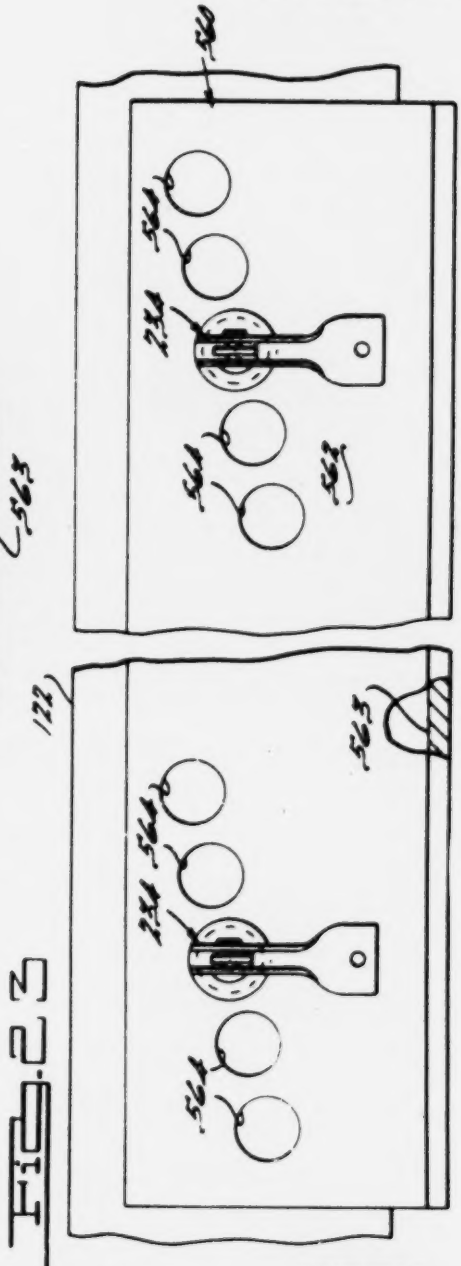

Fig. 2a

INVENTORS
Harvey W. Chapman
Henry L. Dunlap
BY
Harness, Dickey & Pierce
ATTORNEYS

United States Patent Office

2,834,304
Patented May 13, 1958

2,834,304

FREIGHT LOADING APPARATUS

Harvey W. Chapman, Detroit, and Henry L. Dunlap, Dearborn, Mich., assignors to Evans Products Company, Plymouth, Mich., a corporation of Delaware

Application September 21, 1954, Serial No. 457,474

17 Claims. (Cl. 105—369)

The present invention relates to the loading, stowage and securing of freight in ships, warehouses, freight cars and trucks, and other freight storage and freight hauling equipment. More specifically, the invention relates to freight loading equipment adapted for permanent installation and especially adapted to the stowage of palletized loads. Most specifically, the invention relates to permanently installed apparatus, dunnage and other equipment for the stowage of ammunition and other dangerous cargo in the holds of ships, which equipment is especially designed to expedite the breaking out of portions of the cargo, without disturbing unwanted cargo, while under way at sea.

It is a principal object of the invention to provide freight loading apparatus for permanent installation which will safely secure any type of freight and which permits quick and easy breakout of the cargo.

Another important object of this invention is to provide freight loading apparatus including portable, removable self-stowing dunnage members.

Still another important object is to provide freight loading apparatus using a combination of fixed and portable members which are of standard dimensions enabling the planning of the load before actual loading begins, yet which embody such flexibility that unexpected variations in freight dimensions or variations in hold dimensions from ship to ship can easily be accommodated.

Another important object of this invention is to provide freight loading apparatus which conserves space, provides greater accessibility, and simplifies rebracing of the load after a portion has been removed.

Yet another object is to provide freight loading apparatus employing standard members which are capable of highly specialized application such as the stowing and securing of munitions ranging from small to large sizes.

Other objects and advantages will be apparent, or will become apparent, in the following more detailed description of the invention, especially when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective view with portions broken away of one hold of a cargo ship in which the freight loading apparatus of this invention is installed, and showing in particular the various manners in which the apparatus may be utilized to secure various kinds of freight.

Fig. 2 is a perspective view, partially in section, showing one manner of installing the permanent deck members utilizing hold-down plates to secure a channel-like sectioned member;

Fig. 3 is a perspective view similar to Fig. 2 showing a manner of installing permanent longitudinal deck members having a "hat" section by means of studs welded to the deck together with the use of removable horizontal deck members and planking;

Fig. 4 is a perspective view similar to Figs. 2 and 3 showing a third manner of installing the permanent deck members, this method utilizing angle guides, angle brackets and seat plates;

Fig. 4A is a fragmentary view in perspective showing the manner in which a channel-shaped longitudinal deck member may be secured to the deck and removable horizontal deck members and planking secured thereto.

Fig. 5 is a plan view, with portions broken away and in section, of a portable deck member intended to be secured over the top of the permanent deck members of Figs. 1 to 4 in order to locate a bracing structure at intermediate points within the sides of the grid-like pattern.

Fig. 6 is a side elevation of the portable deck member of Fig. 5;

Fig. 7 is a perspective view, with portions broken away, of one end of the portable deck member of Figs. 5 and 6, and showing in particular the latching mechanism installed on both ends of such member;

Fig. 8 is an end view of the portable deck member of Figs. 5 to 7, the view being taken in the direction of the arrow 8 of Fig. 7;

Fig. 9 is a cross-sectional view of the portable deck member of Figs. 5 to 8, the section being taken along the line 9—9 of Fig. 5.

Fig. 10 is a side-elevational view, with portions broken away and in section, showing a telescoping vertical freight-bracing member such as is shown in Fig. 1, erected on the grid-like pattern of holes in the deck members;

Fig. 11 is a fragmentary longitudinal section through the latch-locking end of the vertical bracing member of Fig. 10, the section being defined by the arrows 11, 11 of Fig. 10;

Fig. 12 is a cross-sectional view of the vertical bracing member of Fig. 10, the section being along the line 12—12 of Fig. 10;

Fig. 13 is another cross-sectional view of the vertical bracing member of Fig. 10, the section being taken along the line 13—13 of Fig. 10, showing in particular the manner of securing the ends of the telescope spring mechanism;

Fig. 14 is a side-elevational view, with portions broken away and in section, of a tomming member (horizontal freight brace) such as is shown erected in Fig. 1.

Fig. 15 is a cross-sectional view of the square central body portion of the tomming member of Fig. 14, the section being taken along the line 15—15 of Fig. 14;

Fig. 16 is a cross-sectional view showing the lock pin assembly of the tomming member of Fig. 14, the section being taken along the line 16—16 of Fig. 14;

Fig. 17 is a cross-sectional view on line 17—17 of Fig. 14 through one end of the tomming member showing the offset nature of the mounting of the latch member.

Fig. 18 is an enlarged view, with portions broken away and in section, of one of the latch fittings of the tomming member of Figs. 14 to 17, the portion enlarged being indicated by the line 18—18 of Fig. 14;

Fig. 19 is a plan view of an auxiliary, portable T-shaped deck or overhead member for use in erecting vertical bracing members at points within a grid unit;

Fig. 20 is a side view of the member of Fig. 19.

Fig. 21 is a diagrammatic plan view showing one manner of using the member of Figs. 19 and 20;

Fig. 22 is a sectional view through the vertical bracing member of Figs. 10 to 13 and showing attached thereto an adjustable snugging member to enable the bracing member to support the cargo in situations where it is not possible or practical to correctly position a vertical bracing member; and

Fig. 23 is a fragmentary side view of the adjustable snugger of Fig. 22, showing in particular one arrangement of holes provided for adjustability.

In accordance with the present invention, there has been provided a freight loading apparatus intended for more or less permanent installation in a freight trans-

porting vehicle such as a ship, freight car, or truck, or warehouse and the like, which apparatus comprises a grid of fixed and/or removable deck members of structural metal assembled on a freight-supporting or other surface, preferably though not necessarily arranged in a square or rectangular pattern and disposed parallel or at an angle with the confining walls or surfaces and obstructions and other impediments so as to make the most efficient use of the surface area available; a matching grid-like pattern of structural metal deck members supported in substantially parallel alignment on the overhead above that on the freight-supporting surface or opposed to the other surface, the members of each grid pattern having on their juxtaposed exposed surfaces, at least, a pattern of aligned holes; portable deck members having a pattern of holes in an exposed surface and which span at least one unit of the grid-like pattern of deck and overhead members to serve as bulkhead anchors, etc. and as a base for the erection of bracing members at nearly any point within the pattern unit; and telescopically adjustable, vertical and horizontal freight bracing bars or members likewise having a pattern of holes on their surfaces, which bracing members are adapted to be erected on or between the opposed grid-like patterns by locking in the holes therein, together with auxiliary equipment such as T-shaped portable auxiliary members having a pattern of holes to assist in erection of vertical members any place on the surface and other devices disclosed in a divisional application hereof.

In Fig. 1, there is shown a perspective view of one hold of an ocean-going freighter, the hold being under the main deck and having a second deck (not shown), a third deck 20 below the second deck, a first platform 22 below the third deck 20 and an inner bottom 24 below the first platform. On the third deck and inner bottom, there is somewhat schematically illustrated a grid-like pattern of deck and overhead members including parallel long structural metal members 26 running lengthwise of the ship and short horizontal structural members 28 extended across or between the longitudinal members, both types of deck members being fixed to the deck by any of the methods illustrated in Figs. 2 to 4A. On the first platform 22 there is shown a slightly different, alternative arrangement of deck members wherein there are, as on the third deck 20 and inner bottom 24, longitudinal structural metal members 26 extending fore and aft of the ship and removable transverse or horizontal deck members 30 (see Fig. 3) which have spring-biased clevis latch pins 32 on their ends for insertion into and locking with any of a pattern of holes 34 on the sides of the fixed longitudinal deck members 26. In both cases, the longitudinal 26 and horizontal 28, 30 deck members are preferably arranged to form squares.

In both of the grid-like pattern systems illustrated in Fig. 1, the grid-like deck pattern is duplicated on the overhead surface 33 and on a framework 35 over the bottom gussets 37 so that the opposed members of each pattern are in accurate alignment. In both arrangements of deck members 26, 28 (or 30), their exposed surfaces (see Figs. 2 to 4) have at least two, and preferably three, straight lines of holes 36 in which the distance between lines and holes are, preferably, though not necessarily, the same. As can be seen in Figs. 3 and 4, the holes 36 in the adjacent lines are not staggered so that they also lie in straight lines of preferably three holes extending perpendicularly to the lengths of the members 26, 28, and 30. This provides a grid-like pattern of holes in deck and overhead in any pair or trio of which various types of self-locking bracing members, cargo jacks, chock assemblies, wedge assemblies and chain and cable hook and shackle assemblies may be secured. Any of the latter may be inserted in a group of holes in one line or across the lines in adjacent, aligned holes. As will be pointed

out in greater detail in conjunction with Figs. 4 to 9, portable deck members 80 are provided, which have a length enabling them to span the grid in either direction, which are locked into holes to serve as bulkhead stops, as a base for verticals and as an anchor for racks, chocks, wedges, jacks, etc., at any intermediate point within the sides of the square of the deck or overhead grid. This enables the erection of verticals at nearly any position on the freight loading surface.

As will be more clearly described in connection with Figs. 10 to 13, the vertical or upright bracing members 120 have on all four sides a pattern of lines or a line of holes 36 arranged on the same center distance pattern as those of the deck members 26, 28 or 30. This permits the insertion of horizontal self-locking, pivotable bracing and tomming members 190 such as are shown in greater detail in Figs. 14 to 18. Together with the vertical bracing members 120 and/or portable deck members 80, bulkheads, walls, racks, shelves, anchors, etc., that differ widely in shape, description or complexity may be erected in many different places on the freight-supporting surface. The horizontal bracing or tomming members 190 and portable deck members 80 likewise have on their exposed surfaces a pattern of lines of holes 36 matching that of the deck and vertical members.

Referring now more specifically to Figs. 2 to 4, it will be seen that the longitudinal deck members 26 may have a simple channel cross section as shown in Figs. 2 and 4, or a "hat" section as shown in Fig. 3, or the shape of any other channel-like structural member. As shown in Figs. 2 and 4, a series of stud bolts 50 are welded directly to the metal deck 52. Over the resulting lines of studs a hold down plate such as plate 54 in Fig. 2 is bolted and the longitudinal deck members 26 are edge welded directly thereto. For the deck member arrangement of the third deck and inner bottom, the transverse deck members 28 are secured in the same fashion. As will appear in Fig. 3, the longitudinal deck members 26 having a "hat" section are secured by parallel lines of studs 50 welded directly to the deck and which are passed through bolt holes provided in the projecting flange 58. The flange is then slipped over the studs and secured thereto. Also, as shown in Fig. 4, longitudinal deck member 26, of simple channel cross section, may be provided with welded-on washers 56 and angle brackets 58. An aligned pattern of studs 50 is first welded directly to the deck so that the channel seat plates 56 and channel 26 can be slipped thereover. The seat plates 56 are then welded to the angles 58. Then the angles 58 are welded to the outside of the channel. Lastly, the angles 60 are positioned against channel 26 and angles 58 and welded to the deck. While the latter is a more expensive installation, it offers greater rigidity in the deck and prevents chance displacement of deck members due to loosening of studs or nuts by vibration.

In the two deck member arrangements shown in Fig. 1 the longitudinal members 26 may be anchored to the metal ship deck by any of the methods shown in Figs. 2 to 4 and by any other suitable arrangement. In the arrangement shown on the first platform (Fig. 3), however, the transverse deck members 30 are removable and are anchored on both ends in holes 34 in the longitudinals 26 by means of a spring biased U-type of clevis 32 wherein the pin-like ends 66 are inserted in the holes 34. The pins 66 are retracted by a screwdriver-like tool, rod or lever inserted through one of the holes 36 so as to engage the closed end of clevis 32 and retract it against the action of spring 68. The use of removable members 30 provides a flush deck and permits the ready re-arrangement of the basic grid-patterns on the deck and overhead surfaces to suit special cargo types. The apparatus employing fixed transverse members, however, is less expensive to build and maintain due to the lesser number of latches, tools, etc., required, and it also con-

tributes greater rigidity and load-bearing ability to the metal deck or other freight-supporting surface.

With either fixed or removable horizontal deck and overhead members, the interior area of each square of the grid is usually filled in with suitable top decking material, such as the wood planking 70 shown in Figs. 2 to 4, or synthetic tile, rubber or plastic-covered composition board, and the like. This is to provide a level non-sparking surface on which to stow freight. As shown in Figs. 2 and 4, the wood planking or plywood can be secured to the metal deck by several lines of studs 50 welded directly to the deck. The latter arrangement contributes increased rigidity and weight carrying capacity to the deck. The overhead grid pattern, however, usually is not filled in in this manner. Likewise, as shown in Fig. 3, with the arrangement utilizing removable transverse members 30, the space inside the square is filled in with removable planking members 72 each member having a U type clevis latch 32 similar to that of the removable horizontal deck members 30. While this arrangement is more versatile, the planking 72 does not contribute rigidity to the deck. If desired for the stowage of ammunition, the various metal deck and bracing members can be provided with a non-sparking rubber or plastic covering or be made of a non-sparking metal such as aluminum.

Portable deck members

On the above-described grid-like pattern of holes, portable deck members 80 (Figs. 5 to 9) are disposed at any intermediate point. The member 80 has a fixed length equal in length to a side of the square, a rectangular cross section made up of a pair of bottom plates 81 and a channel-like body member 82 (Figs. 8 and 9) having in its top surface a line of holes 36 in in-line arrangement, and on either end a pair of opposed, lever-operated lock or latch pins 86, 88 and a fixed load-bearing pin 90 therebetween, the pins all lying in substantially one plane extending perpendicular to the body member 82. The bottom plates 81 and the channel 82 are bolted together by carriage type bolts 83 tapped into spacer legs 85 integral with the plates 81. The pins 86, 88, and 90 are inserted in any three holes in a pair of transverse or longitudinal deck or overhead members 26, 28 or between any parallel pair of vertical or horizontal bracing or tomming members.

The end-lock arrangement for pins 86, 88 is best seen in Figs. 5 and 7, the pins each being secured to a lever 92, each of which is pivoted on its inner end on a pin 94 passed through bottom plate 81. Each of pins 86, 88 are secured to its lever 92 by a lock nut 100 and large washer 101. Each lever 92 has a transversely-projecting lock handle portion 96 having upturned or downturned ends 98, the handle 96 for each lever 92 passing over or under the other lever 92 to project on the far side. Across the post-like upper ends 102 of the pins there is secured a transverse extension spring 104 which urges the pins 86, 88 together. The upper ends 102 are supported by bearing against the upper inner surface of the channel web. Since the inner surfaces of each of the lock pins are cut away to form a dog or shoulder 106, the action of spring 104 will cause the pins 86, 88 to move toward each other and engage the inner circumference of each grid hole 36 and lock the member thereto. Insertion of lock pins 86, 88 into the holes is facilitated by the conically tapered lower ends 108 which will cam the pins apart against spring resistance. The end lock mechanism on each end of the member is released by simultaneously pressing in on each end 98 of the lock handle portion 96 of levers 92, this movement releasing the shoulders 106 and freeing the pins 86, 88. The end-lock mechanism may also be opened by inserting a round-ended bar, or other like tool, through one of the holes 36 near the intersection of the levers 92 and moving a tool to spread the inner ends of the levers 92 thereof. As is shown most clearly in Fig. 5, one of the

lock levers 92 has an integral cam surface 110 formed by spot welding a piece of metal to top surface 4 of the lever to bring it level with the top surface of the other lever, the rounded cam surface 110 serving as a smooth tool engaging surface against which the unlocking tool rotates. As will be noted, the portable deck member 80, unlike the permanent deck grid members, has in its top surface 112 only a single line of holes 36. Since the member can be placed at any point in the sides of the squares a double row is usually unnecessary, although any number of lines could be provided, if desired.

Vertical bracing member

Figs. 10 to 13 illustrate the construction of the telescoping vertical freight bracing member 120. The latter has an elongated main body portion 122 of substantially square cross section having in each of its sides a pattern of holes 36 corresponding in spacing to that of the deck grid members 26, 28. While other cross-sectional shapes may be employed, it has been found that the square section is most versatile. On one end of the square body portion, normally considered the top end of the member, there is a projecting telescopic fitting member 124 also having a square cross section. Welded to the outer end of telescope member 124 is a head plate 126 on which are integral pins 128 spaced at twice the distance between holes 36 for insertion in the permanent or portable deck and overhead grid holes 36. On the other end of member 120, there is a fitting 130 comprising a sleeve 132 of square cross section which is bolted into the end of body section 122 by means of bolts 134. Attached to the outer end of sleeve 132 is a head plate 136 to which are attached the two fixed load-bearing pins 128 similar to and axially aligned with those on the upper end and which also are spaced apart at twice the distance between grid holes 36. Midway between and substantially coplanar with pins 128 there is provided a latch or lock pin 140 which extends through a hole 138 in head plate 136 and is an integral part of a pivotable latch lever 142. The latter is pivoted on a hollow shaft 144 which is extended across and mounted on opposite side sections of the sleeve 132, being held in place by the body section 122. Collars 146 are provided to prevent chance displacement of shaft 144. In order to spring bias the latch lever 142 and make its projecting pin 140 self-locking, a small projection or arm 148 on lever 142 is connected to an extension spring 150 having its other end connected to a pin 152 which is extended across sleeve 132 and held in position by the overlapping body section 122.

The square upper telescopic fitting 124 is supported in a square sleeve 170 which is bolted into the end of body section 122 by means of bolts 171, the sleeve 170 having integral end plates 172 and 173 which serve as supports for slide 124. On its inner end, slide member 124 is connected to a round extension shaft 174 by means of an end plate or collar 175 and by a bolt 177 passing diagonally through the slide 124 and extension shaft 174. On its other end, extension shaft 174 is guided by a diagonal spanner-type slip collar 176 having rounded ends which fit into the corners of body 122. A pair of elongated bolts 178 are passed through end plate 173 and through slip collar 176 to compress a compression spring 180 disposed around the extension shaft 174. Tightening or loosening of the nuts on bolts 178 increases or decreases the force exerted by spring 180. The latter is adjusted to exert sufficient force to support the full weight of the member 120 on the head plate 126 so as to maintain engagement of the pins 128 in the grid holes 36 whether the member is used right side up (resting on head plate 136) or upside down, as just described.

In use, the vertical bracing member 120 may be installed by first inserting the pins 128 in its upper telescoping end in the holes 36 of the overhead grid, pushing upwardly on the member to telescope it sufficiently to give clearance to the lower lock pin end 130, and then aligning pins 128

and 140 with holes in the lower deck and pushing the bar 130 down into position, the tapered end of latch pin 140 camming it to the left in Fig. 11 so it will enter the hole and then be snapped back into locking position by gravity and spring 150. The verticals 120 may be unlatched for removal by raising handle 156 or depressing handle 157 until latch shoulder 158 of the latch pin 140 is disengaged from the edge of hole 36. The latch fitting 130 may be inserted first, if desired, to provide for installation by the reverse of the procedure mentioned.

In some cases, it may be desirable to clamp or bolt auxiliary wooden or metal strips to one or more sides of the vertical member 120 in order to make contact with odd-shaped items of cargo and yet present a straight line of verticals to the next tier of freight or to an aisle. In case the freight is odd shaped or standardized crates or pallets are incorrectly dimensioned, the added thickness of wood or metal would do away with the necessity for having one vertical out of line with respect to the others in the same line.

Tomming member

The details of the horizontal bracing bar, or tomming member 190, are shown in Figs. 14 to 18. Like the vertical bracing member 120 the member 190 has an outer body section 192 of square cross section but it differs in that both ends have fittings 200 that are telescopic in the body and provided with means to mount and secure the bar in holes 36. It should also be noted that the fittings 200 are mounted off center (Fig. 17) at different distances "a" and "b" with respect to each mid-plane of the member to permit rotation of the body section 192 to provide a pitch-splitting feature to take up progressive increments of slack between one or more grid holes 36. As shown in Fig. 14 the hollow body section 192 receives the fittings 200 in both ends, each fitting including an inner telescope slide or sleeve 194, square in cross section and provided on two sides with holes 196 having a closer spacing than the holes 36 in outer body section 192, for example 1.25 inches as against 1.5 inches for the holes 36. The sleeves 194 do not meet in the center of the body 192 so as to permit them to freely slide in and out to shorten or lengthen the member 190. Inside each of the outwardly projecting end portions of sleeves 194 there are two transverse shaft bearing end plates 197 in which is supported a short, round, hollow shaft 198, the latter being located off center in end plates 197 as indicated by dimension lines *a* and *b* in Fig. 17. The shaft is held in axial position by means of a bolt 202 extended through end plates 197 and shaft 198. A washer 204 and a lock nut 206 are provided on the inner end of bolt 202 to hold the parts together. It will be seen that the body portion 192 can be rotated about the offset axis of shafts 198 to take up small increments of slack between the member and freight after the ends have been located in the nearest sets of holes 36 in the vertical members.

The fittings 200 each have a latch assembly welded to shafts 198 which include body section 203, a pin-supporting outer plate 205, and an inner shaft-attached plate 207. The pin-supporting plate 205 has two straight, integral locator and load transmitting pins 208 (Fig. 18) and midway between which there is an enlarged hole 210 through which a latch pin 212 is mounted. The pins 208 and 212 are substantially coplanar though the center line of the latch pin 212 is offset slightly above that of the rigid pins 208 as seen in Fig. 14 so that it will be slightly misaligned with the hole 36 when the pins 208 are aligned with a pair of holes 36. The latch pin 212 has a shoulder 214 for engagement under the edge of each of the holes 36 in the vertical members. The latch or lock pin 212 is an integral part of a latch lever 216 having a handle 218 projecting on either side. The lever 216 is pivoted on a hollow shaft 220 also offset above the center lines of pins 208 and which is bolted in place on the side walls of body 203 by means of end bolts 222. On a projecting anchor arm 224 there is secured a compression spring 226 having its other end anchored to a bolt 228 in the shaft attached inner head plate 207.

The latch lever 216 can be operated by pulling or pushing on either handle 218 to disengage the shoulder 214 of lock pin 212 from the edge of the hole. Likewise the pins 208, 212 can be inserted by first positioning the straight-sided pins 208 above the grid holes 36 and then moving the handles 218 until pin 212 comes into alignment allowing all three to enter the holes. Release of the handles 218 locks shoulder 214 under the edge of the hole 36. It is also clear that if the latch is not manually unlocked during insertion of the bar in the holes, the tapered end of the lock pin 212 will be cammed toward the pins 208 (down in Fig. 14) to enter a hole and then will be snapped back into latching position by spring 226.

As pointed out above, the sleeves 194 of fittings 200 can move inwardly to give clearance for the pins 208, 212 and outwardly to increase the overall length of the tomming member 190. A triangular stop 229 is provided on opposite corners of each end of outer body member 192 to limit outward movement, the stops being anchored by set screws 231. The sleeves 194 have their corresponding corners shaped at 232 to pass over the stops and provided with shoulders 233 to limit outward movement by engagement with stops 229.

When the length of the bar has been adjusted and the pins 208, 212 of both ends locked in the holes of the vertical members, a lock pin assembly 234 (Fig. 16) may be passed through opposed holes 36 in body section 192 and opposed holes 196 in sleeves 194. Due to the closer spacing of holes 196 a vernier adjustment of the length of the member is possible. The lock pin 234 (Fig. 16) comprises a hollow tube 236, a pair of collars 238, and a lock rod 240 passed through tube 236 and both collars. On one end of lock rod 240 there is located a compressible rubber or plastic rubber washer 242 held in place by an outer cap 244. On the opposite, or handle end, of rod 240 there is secured a clevis 246 in which there is mounted an eccentric handle 248, the latter having a round cam surface 250. When the handle 248 is brought to the dotted line position of Fig. 16 the cam will be of minimum radius (seen best in Fig. 22) with the result that the washer 242 is uncompressed and can be inserted through the holes 36, 196. When, however, the handle is rotated 180° to the position indicated in solid outline, the washer 242 will be compressed making it impossible to withdraw it through the holes. The lock pin assembly 234 is simple in operation and can be quickly inserted in the member after it has been mounted in place.

Auxiliary T Member

As pointed out above the portable deck members 80 and rotatable tomming members 190 make for flexibility with the grid pattern of fixed deck and overhead members 26, 28. These members make it possible to erect the vertical bracing members 120 at intervals corresponding to the spacing of holes 36 anywhere on the freight supporting surface. Instances may occur, however, where a tier or row of freight "A" ends in the interior of a square (see dotted outline X Fig. 21). In such instances, it is possible to mount a number of the portable deck members 80 on the overhead in side-by-side relation to receive the upper ends of vertical bracing members 120 on each side of the corner. On the deck, however, the freight and the first portable member 80 interfere with the placement of another intersecting portable deck member 80 to brace the other side "X" of the corner. For this situation, the portable T member 510 is provided. The member 510 comprises a "head" section 512 secured on top of a "leg" section 514. The head section 512, which contains the latch pins and locking assembly, comprises a wing-shaped base plate 516 welded to a top plate 518 of the "leg" section 514, two upstanding side plates 520 welded to plate 516, a transverse brace

block 522 and end plate 523, and on the bottom side of the extremity of each wing a fixed, straight-sided pin 524. In the center of plate 516 there is provided a hole in which is disposed a latch-operated lock pin 528 substantially coplanar with pins 524 and having a shoulder 530 for engagement with the edge of a deck grid hole 36 in which it is inserted. The pin 528 is secured to a slide plate 532 by means of a nut threaded over the upper end of the pin. The plate 532 is provided with an upstanding, welded on spacer-guide plate 534 to guide the plate 532 in its back and forth sliding movement between side plates 520.

A bolt 538 is passed through both side plates 520 to serve as a pivot for a tongue-shaped latch-operating lever 540. The latter is welded to a sleeve 542 which encircles bolt 538. Also welded to sleeve 542 is a short, downwardly-depending arm 544 which makes contact with a spring-retainer collar 546 in contact with a coiled compression spring 548 carried by a rod 550. The latter is supported by the brace block 522 and end plate 523 with the other end of spring 548 bearing against a second spring-retainer collar 552 and guide plate 534. With this arrangement, the spring 548 is full floating and always acts to urge the plate 534 and its sliding mechanism to the left or locking position. The spring 548 also normally acts to depress the lever 540 to the closed position. The shoulders 554 on either side of the tongue bear against plate 534 and prevent accidental displacement of the pin 528 and its sliding mechanism toward the right or to the unlocked position.

The member 510 is installed in deck or overhead grid holes by raising the tongue-like lever 540 until the shoulders 554 are clear of plate 534, the pin 528 is grasped by its nut and pushed to the right (or else cammed to the right by engagement of its tapered bottom with the edge of a hole 36), all three of pins 524, 528 then are pushed into holes, and the lever 540 released. The member is then locked into position with all load being borne by shoulders 554 instead of by spring 548.

The "leg" section of the T-shaped member comprises three plates 518, 556 welded to form a rectangular box-shaped member. The top plate 518 is provided with five holes 36 arranged in a square with one hole in the center so that the three pins of vertical bracing members 120 can be inserted in either of two directions. As will appear most clearly in Fig. 21 the member 510 will be placed with the wing-shaped "head" 512 placed over the top surface of the member 80. The "leg" section 514 rests flat on the deck or planking members 70 to serve as a firm anchor for a corner vertical bracing member 120.

Cargo Snugger Attachment

As mentioned hereinbefore, in some instances odd-shaped articles of freight or cargo, or off-dimensioned crates, pallets, etc., make it impossible to insure contact with a straight line of vertical bracing members 120. In some instances, as explained hereinbefore, this contingency can be taken care of by gluing or bolting a piece of wood or metal to the verticals but this requires a series of members with various thicknesses of strips. The attachment 560 shown in Figs. 22 and 23, however, can be attached to bracing bars available in the ship and the attachment so designed so as to be adjustable outwardly a distance to cover most commonly occurring contingencies.

The snugger attachment 560 comprises a U-shaped frame made by welding two side plates 562 and a front plate 563 together at right angles. The frame may be made sufficiently long to cover substantially the entire body section 122 of the vertical bracing members 120 or they may be made a fraction of the body length so that one or more may be installed as required. The frame is slipped over the outside of the square body section 122 (Fig. 22). Adjustability is provided by an

angularly aligned pattern of holes 564 on each side of the frame, preferably near both the top and bottom ends. As shown in the side view of Fig. 23 the centers of holes 564 are disposed on a line intersecting the longitudinal center line of side plate 562 so as to provide incremental adjustment in an outward direction. The holes 564 are spaced apart at the same center distance as the holes 36 in the body section 122 of the bracing member or rather the distance between like holes in the frame must be a multiple of the spacing between holes 36. A suitable means for securing the frame of the snugger 560 to the bracing member 120 is similar to the lock bolt 234 shown in Fig. 16. At least two such bolts usually will be required. Separate lock bolts inserted from each side of the member could be utilized, if desired. At least one of the holes 564 preferably should be located on the longitudinal center line of the side plates 562 in order to permit retraction of the frame to bring front plate 563 into contact with the body 122 of the bracing member so that such members can be used without extension of the snugger where this is necessary.

The apparatus of this invention is installed in a freight-transporting vehicle, such as a ship, or in a freight-storage area, such as a warehouse, with the fixed and/or removable deck members 26, 28 first being affixed to a deck, floor or wall most advantageously employed at a spacing found most convenient. In a ship, for instance, a spacing of about four feet may be employed because such a pattern permits breaking up of the cargo into self-contained units with ample aisle space for access. The bulky freight or cargo items are then simply moved into position and secured by erection of an appropriate number of vertical and horizontal bracing bars. The latter are strong and light enough in weight as to be easily handled and installed by one man. Since the dimensions of crates, pallets, boxes, etc., even though of standardized design, vary as much as 1 or 2 inches, it can be readily appreciated that the final length of rows or tiers of such items are seldom known until they are laid end to end and side by side. This is no serious disadvantage with the apparatus of this invention since the gridlike pattern of holes in the deck and overhead members permit the erection of verticals at very small intervals. For example, the grid holes 36 of the deck and overhead members of the installation shown in Fig. 3 were located on 1.5 inch centers. There are, however, instances where a corner or an entire row or tier terminate at a point within the square defined by the intersecting deck members. The apparatus of this invention provides portable deck members, auxiliary T members and rotatable off-center horizontal bracing members to take care of these contingencies. By locating one or more portable deck members and/or T members at any point within or between the intersections of the grid members it is possible to locate verticals, for example at 1.5 inch intervals. The cargo snugger attachment on some of the vertical members takes care of situations where the verticals must be in a straight line for aisle purposes, etc. The horizontal bracing members can then be installed and rotated to take up increments of less than 1.5 inches in order to insure lateral contact with the cargo or freight.

Breakout of portions or individual items of freight or cargo is much simplified with the apparatus of this invention. The easy placement of verticals make it a simple matter to lay out adequate aisles and lanes between dissimilar types of cargo. After removal of a portion of the cargo the bracing members are moved in to engage the remaining items of freight in the row or stack, or they may be removed entirely and stored at a convenient point near a hatchway or door, etc. Stowage of the unneeded bracing members entails nothing more than inserting the pins of the bracing members in unused, out-of-the-way deck members to form a compact vertical or horizontal row or stack of members. This same self-stowing feature also facilitates loading, the reserve members being stowed

near the hatchway, elevator or entryway where they are always available for use as the loading proceeds from the far corners and progresses toward the entryway.

While only a few preferred embodiments of the invention have been disclosed herein it is to be understood that further variations and modifications can be made without departing from the spirit and scope of the appended claims.

What is claimed is:

1. A freight bracing bar for extending between and being supported at its ends in aligned series of holes in spaced support surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body that are no wider than the body and each of which has a pair of pins for entry into selected said holes to secure the bar in place, said body having at least one elongated bore extending lengthwise of the body and opening out of one end thereof, one of the fittings having a portion telescopically mounted in said bore, coengageable stop surfaces on said one fitting and body for limiting the telescopic movement of said one fitting in said bore, both said fittings having side sections which are laterally spaced from each other and extend parallel to the length of the bar, the pins of each said pair being laterally spaced from each other and rigid with the corresponding fitting and projecting parallel to each other and to the length of the bar and located on opposite sides of the fitting, said pins of each pair having tapered ends for extending into spaced pairs of said holes in a said support surface, each fitting having a latching lever located centrally between the corresponding said side sections and pivoted on the corresponding fitting for movement about an axis transverse to the length of the body, each said lever including a handle portion located between the corresponding said side sections and movable in a plane parallel to them, each said lever further including a tapered-end latch pin extending parallel to the corresponding said side sections for entering a said hole intermediate said spaced pair of holes, each said latch pin being located approximately midway between the corresponding rigid pins and approximately in a plane defined by such rigid pins, each said latch pin having a transverse locking surface thereon facing toward the bar body for engaging behind said support surface when the lock pin extends through a said intermediate hole, spring means acting between the lever and each fitting and biasing the corresponding said latch pin to a position in which it partially but not completely registers with a said intermediate hole when the corresponding rigid pins completely register with said pair of holes, each said latch pin being movable against the opposition of said spring means to a position in which it registers with a said intermediate hole, thereby enabling said fittings to be moved toward the respective said support surfaces to thereby project said rigid pins and said latch pins through the corresponding holes and enabling the latch pins to engage behind the said surfaces and prevent withdrawal of the pins from the holes.

2. A freight bracing bar for extending and being supported at its ends in aligned series of holes in spaced support surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body and each of which has a pair of pins for entry into selected said holes to secure the bar in place, said body having at least one elongated bore extending lengthwise of the body and opening out of one end thereof, one of the fittings having a portion telescopically mounted in said bore, coengageable stop surfaces on said one fitting and body for limiting the telescopic movement of said one fitting in said bore, the pins of each said pair being laterally spaced from each other and rigid with the corresponding fitting and projecting parallel to each other and to the length of the bar and located on opposite sides of the fitting, said pins of each pair being adapted to extend into spaced pairs of said holes in a said support surface, each fitting having a latching member pivoted on

the corresponding fitting for movement about an axis transverse to the length of the body and comprising a latch pin extending parallel to the corresponding rigid pins for entering a said hole intermediate said spaced pair of holes, each said latch pin being located approximately midway between the corresponding rigid pins and approximately in a plane defined by such rigid pins, each said latch pin having a transverse locking surface thereon facing toward the bar body for engaging behind said support surface when the latch pin extends through a said intermediate hole, spring means acting between the latch member and each fitting and biasing the corresponding said latch pin to a position in which it partially but not completely registers with a said intermediate hole when the corresponding rigid pins completely register with said pair of holes, each said latch pin being movable against the opposition of said spring means to a position in which it registers with a said intermediate hole, thereby enabling said fittings to be moved toward the respective said support surfaces to thereby project said rigid pins and said latch pins through the corresponding holes and enabling the latch pins to engage behind the said surfaces and prevent withdrawal of the pins from the holes.

3. A freight bracing bar for extending between and be supported at its ends in aligned series of holes in spaced support surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body and each of which has a pair of pins for entry into selected said holes to secure the bar in place, said body having at least one elongated bore extending lengthwise of the body and opening out of one end thereof, one of the fittings having a portion telescopically mounted in said bore, coengageable stop surfaces on said one fitting and body for limiting the telescopic movement of said one fitting in said bore, the pins of each said pair being laterally spaced from each other and rigid with the corresponding fitting and projecting parallel to each other and to the length of the bar, said pins of each pair being adapted to extend into spaced pairs of said holes in a said support surface, a latch carried by each said fitting for movement thereon between latching and releasing positions, each said latch including a latch pin extending parallel to the corresponding said rigid pins for entering a said hole intermediate a said spaced pair of holes, each said latch pin being located between the corresponding rigid pins and approximately in a plane defined by such rigid pins, each said latch pin having a transverse latching surface thereon facing inwardly toward the bar body for engaging behind a said support surface when the latch pin extends through a said intermediate hole and the latch is in the latching position, spring means acting between each latch and the corresponding fitting and biasing the corresponding said latch pin toward the latching position, each said latch pin being movable against the opposition of said spring means to the releasing position in which it can be projected into and withdrawn from a said intermediate hole, thereby enabling said fittings to be moved toward the respective said support surfaces to thereby project said rigid pins and said latch pins through the corresponding holes and to cause the latch pins to engage behind the corresponding said surfaces, and prevent withdrawal of the pins from the holes.

4. A cargo bracing bar for extending between and being supported at its ends in aligned series of substantially identical holes in spaced support surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body and each of which have pairs of pins for entry into selected said holes to secure the bar in place, said body having at least one slide portion extending lengthwise of the body adjacent one end thereof, one of the fittings having a portion telescopically and slidably mounted on said slide portion, coengageable stop surfaces on said one fitting and body for limiting the telescopic movement of said one fitting on said slide

portion, each of said fittings having a pair of laterally spaced pins rigid with the fitting and which project parallel to each other and to the length of the bar, said pins being adapted to extend into any selected spaced pair of said holes in a said support surface, a latch movably carried by one of said fittings for movement between latching and unlatching positions, said latch including a latch pin extending parallel to said rigid pins for entering when the latch is in unlatching position any said hole intermediate any said spaced pair of holes, said latch pin being located between the corresponding rigid pins and approximately in a plane defined by such rigid pins, each said latch pin having a transverse latching surface thereon facing inwardly toward the bar body for engaging behind said support surface when said rigid pins and said latch pin are projected through the corresponding holes and the latch is in latching position, and thereby prevent withdrawal of the pins from the holes.

5. A freight bracing system for holding articles of freight in stowed positions comprising spaced oppositely disposed surfaces, each of said surfaces being provided with patterns of holes which patterns are aligned on said spaced surfaces, each said pattern comprising three laterally spaced, parallel, substantially straight rows of regularly spaced holes, corresponding holes in respective rows lying in lines at right angles to the length of the rows, a freight bracing bar for extending between and being supported at its ends in aligned holes on said spaced surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body and each of which has a pair of pins which enter selected pairs of said holes to secure the bar in place, the pins of each pair being rigid with the corresponding fitting and projecting parallel to each other and to the length of the bar and being located on opposite sides of the fitting, said pins being laterally spaced from each other by a distance equal to twice the distance between said rows and also equal to a multiple of the spacing between the holes in each row, so that each pair of pins can be inserted into corresponding holes in the outer ones of said three rows and can also be inserted in a pair of holes in each said row having at least one hole lying midway therebetween, at least one of said fittings having a latching lever pivoted thereon for movement about an axis transverse to the length of the bar, said lever including a handle portion and a patch pin extending parallel to the rigid pins on said one fitting and located approximately midway between the rigid pins on said one fitting and approximately in a plane defined by the rigid pins on said one fitting for entering an intermediate hole lying between the holes entered by said rigid pins, said latch pin having a transverse locking surface thereon facing toward the bar body for engaging behind a said surface when the latch pin extends through a said intermediate hole, spring means acting between the lever and said one fitting and biasing said latch pin to a position in which it partially but not completely registers with said intermediate hole when the rigid pins on said one fitting completely register with a said pair of holes, said latch pin being movable against the opposition of said spring means to a position in which it registers with a said intermediate hole thereby enabling said one fitting to be moved toward a said surface to project its rigid pins and said latch pin through the pair of holes and intermediate hole and enabling the transverse shoulder on the latch pin to engage behind a said surface and prevent withdrawal of the pins from said holes, said bar body having an elongated bore extending lengthwise thereof and opening out of one end thereof, at least one of said fittings having a portion telescopically mounted in said bore, and coengageable stop surfaces on said telescopically mounted fitting and said body for limiting the telescopic movement of the fitting in said bore.

6. A freight bracing system for holding articles of freight in stowed positions comprising spaced oppositely disposed surfaces, each of said surfaces being provided with patterns of holes which patterns are aligned on said spaced surfaces, each said pattern comprising three laterally spaced, parallel, substantially straight rows of regularly spaced holes, corresponding holes in said respective rows lying in lines at right angles to the length of the rows, a freight bracing bar for extending between and being supported at its ends in aligned holes on said spaced surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body each of which has a pair of pins which enter selected pairs of said holes to secure the bar in place, the pins of each said pair being rigid with the corresponding fitting and projecting parallel to each other and to the length of the bar and being located on opposite sides of the fitting, said pins being laterally spaced from each other by a distance equal to twice the distance between said rows and also equal to a multiple of the spacing between the holes in each row, so that each pair of pins can be inserted into corresponding holes in the outer ones of said three rows and can also be inserted in a pair of holes in each said row having at least one hole lying midway therebetween, at least one of said fittings having a latch carried thereby for movement between latching and releasing positions and including a latch pin extending parallel to the rigid pins on said one fitting and located approximately midway between the rigid pins on said one fitting and approximately in a plane defined by the rigid pins on said one fitting for entering an intermediate hole lying between the holes entered by said rigid pins, said latch pin having a transverse locking surface thereon facing toward the bar body for engaging behind a said intermediate hole, spring means acting between the latch and said one fitting and biasing said latch pin toward the latching position, said latch pin being movable against the opposition of said spring means to the releasing position in which it can be projected into and withdrawn from a said intermediate hole, thereby enabling said one fitting to be moved toward a said surface to project its rigid pins and said latch pin through the pair of holes and intermediate hole and enabling the transverse shoulder on the latch pin to engage behind a said surface and prevent withdrawal of the pins from said holes, said bar body having an elongated bore extending lengthwise thereof and opening out of one end thereof, at least one of said fittings having a portion telescopically mounted in said bore, and coengageable stop surfaces on said telescopically mounted fitting and said body for limiting the telescopic movement of the fitting in said bore.

7. A freight bracing system for holding articles of freight in stowed positions comprising spaced oppositely disposed surfaces, each of said surfaces being provided with patterns of holes which patterns are aligned on said spaced surfaces, each said pattern comprising three laterally spaced, parallel, substantially straight rows of regularly spaced holes, corresponding holes in said respective rows lying in lines at right angles to the length of the rows, a freight bracing bar for extending between and being supported at its ends in aligned holes on said spaced surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body each of which has a pair of pins which enter selected pairs of said holes to secure the bar in place, the pins of each said pair being rigid with the corresponding fitting and projecting parallel to each other and to the length of the bar and being located on opposite sides of the fitting, said pins being laterally spaced from each other by a distance equal to twice the distance between said rows and also equal to a multiple of the spacing between the holes in each row, so that each pair of pins can be inserted into corresponding holes in the outer ones of said three rows and can also be inserted in a pair of holes in each said row having at least one hole lying midway therebe-

twean, at least one of said fittings having a latch carried thereby for movement between latching and releasing positions and including a latch pin extending parallel to the rigid pins on said one fitting and located approximately midway between the rigid pins on said one fitting and approximately in a plane defined by the rigid pins on said one fitting and for entering an intermediate hole lying between the holes entered by said rigid pins, said latch pin having a transverse locking surface thereon facing toward the bar body for engaging behind a said surface when the latch pin extends through a said intermediate hole, spring means acting between the lever and said one fitting and biasing said latch pin toward the latching position, said latch pin being movable against the opposition of said spring means to the releasing position in which it can be projected into and withdrawn from a said intermediate hole, thereby enabling said one fitting to be moved toward a said surface to project its rigid pins and said latch pin through the pair of holes and intermediate hole and enabling the transverse shoulder on the latch pin to engage behind a said surface and prevent withdrawal of the pins from said holes.

8. A freight bracing bar for extending between and being secured at its ends in aligned series of holes in spaced support surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body and each of which has a pair of pins for entry into selected said holes to secure the bar in place, said body having at least one elongated bore extending lengthwise of the body and opening out of one end thereof, one of the fittings having a portion telescopically mounted in said bore, coengageable stop surfaces on said one fitting and body for limiting the telescopic movement of said one fitting in said bore, the pins in each said pair being laterally spaced from each other, and rigid with the corresponding fitting and projecting parallel to each other, said pins of each pair being adapted to extend into spaced pairs of said holes in a said support surface, a latch carried by each said fitting for movement thereon between latching and releasing positions, each said latch including a latch pin extending generally parallel to the corresponding said rigid pins for entering a said hole intermediate a said spaced pair of holes, each said latch pin being located between the corresponding rigid pins and approximately in a plane defined by such rigid pins, each said latch pin having a transverse latching surface thereon for engaging behind a said support surface when the latch pin extends through a said intermediate hole and the latch pin is in the latching position, spring means acting between each latch and the corresponding fitting and biasing the corresponding said latch pin toward the latching position, each said latch pin being movable against the opposition of said spring means to the releasing position in which it can be projected into and withdrawn from a said intermediate hole, thereby enabling said fittings to be moved toward the respective said support surfaces to thereby project said rigid pins and said latch pins through the corresponding holes and to cause the latch pins to engage behind the corresponding said surfaces and prevent withdrawal of the pins from the holes.

9. A freight bracing bar for extending between and being secured at its ends in aligned series of substantially identical holes in spaced support surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body and each of which have pairs of pins for entry into selected said holes to secure the bar in place, said body having at least one elongated bore extending lengthwise of the body and opening out of one end thereof, one of the fittings having a portion telescopically mounted in said bore, coengageable stop surfaces on said one fitting and body for limiting the telescopic movement of said one fitting in said bore, each of said fittings having a pair of laterally spaced pins rigid with the fitting and which project parallel to each other,

said pins being adapted for entry into any selected spaced pair of said holes in a said support surface, a latch movably carried by one of said fittings for movement between latching and unlatching positions, said latch including a latch pin extending parallel to said rigid pins for entering when the latch is in unlatching position any said hole intermediate any said spaced pair of holes, said latch pin being located between the corresponding rigid pins and approximately in a plane defined by such rigid pins, each said latch pin having a transverse latching surface thereon for engaging behind said support surface when said rigid pins and said latch pin are projected through the corresponding holes and the latch is in latching position, and thereby prevent withdrawal of the pins from the holes.

10. A freight bracing bar for extending between and being secured at its ends in aligned series of holes in spaced support surfaces, said bar comprising an elongated body having fittings adjacent respective ends of the body and each of which has a pair of pins for entry into selected said holes to secure the bar in place, the pins of each said pair being laterally spaced from each other and rigid with the corresponding fitting and projecting parallel to each other, said pins of each pair being adapted to extend into spaced pairs of said holes in a said support surface, a latch carried by each said fitting for movement thereon between latching and releasing positions, each said latch including a latch pin extending parallel to the corresponding said rigid pins for entering a said hole intermediate a said spaced pair of holes, each said latch pin being located between the corresponding rigid pins and approximately in a plane defined by such rigid pins, each said latch pin having a transverse latching surface thereon for engaging behind a said support surface when the latch pin extends through a said intermediate hole and the latch is in the latching position, spring means acting between each latch and the corresponding fitting and biasing the corresponding said latch pin toward the latching position, each said latch pin being movable against the opposition of said spring means to a position in which it can be projected into and withdrawn from a said intermediate hole, thereby enabling said fittings to be moved toward the respective said support surfaces to thereby project said rigid pins and said latch pins through the corresponding holes and to cause the latch pins to engage behind the corresponding said surfaces, and prevent withdrawal of the pins from the holes.

11. A freight bracing bar for extending between and being secured at its ends in aligned series of substantially identical holes in spaced support surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body and each of which have pairs of pins for entry into selected said holes to secure the bar in place, each of said fittings having a pair of laterally spaced pins rigid with the fitting and which project parallel to each other, said pins being adapted to extend into any selected spaced pair of said holes in a said support surface, a latch movably carried by one of said fittings for movement between latching and unlatching positions, said latch including a latch pin extending parallel to said rigid pins for entering when the latch is in unlatching position any said hole intermediate any said spaced pair of holes, said latch pin being located between the corresponding rigid pins and approximately in a plane defined by such rigid pins, each said latch pin having a transverse latching surface thereon for engaging behind said support surface when said rigid pins and said latch pin are projected through the corresponding holes and the latch is in latching position, and thereby prevent withdrawal of the pins from the holes.

12. A freight bracing system for holding articles of freight in stowed positions comprising spaced oppositely disposed surfaces, each of said surfaces being provided with patterns of holes which patterns are aligned on said spaced surfaces, each said pattern comprising three

laterally spaced, parallel, substantially straight rows of regularly spaced holes, corresponding holes in said respective rows lying in lines at right angles to the length of the rows, a freight bracing bar extending between and being supported at its ends in aligned holes on said spaced surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body and each of which has a pair of pins which enter selected pairs of said holes to secure the bar in place, the pins of each said pair being rigid with the corresponding fitting and projecting parallel to each other and being located on opposite sides of the fitting, said pins being laterally spaced from each other by a distance equal to twice the distance between said rows and also equal to a multiple of the spacing between the holes in each row, so that each pair of pins can be inserted into corresponding holes in the outer ones of said three rows and can also be inserted in a pair of holes in each said row having at least one hole lying midway therebetween, at least one of said fittings having a latch carried thereby for movement between latching and releasing positions and including a latch pin extending parallel to the rigid pins on said one fitting and located approximately midway between the rigid pins on said one fitting and approximately in a plane defined by the rigid pins on said one fitting for entering an intermediate hole lying between the holes entered by said rigid pins, said latch pin having a transverse locking surface thereon for engaging behind a said surface when the latch pin extends through a said intermediate hole, spring means acting between the latch and said one fitting and biasing said latch pin toward the latching position, said latch pin being movable against the opposition of said spring means to the releasing position in which it can be projected into and withdrawn from a said intermediate hole, thereby enabling said one fitting to be moved toward a said surface to project its rigid pins and said latch pin through the pair of holes and intermediate hole and enabling the transverse shoulder on the latch pin to engage behind a said surface and prevent withdrawal of the pins from said holes, said bar body having an elongated bore extending lengthwise thereof and opening out of one end thereof, at least one of said fittings having a portion telescopically mounted in said bore, and coengageable stop surfaces on said telescopically mounted fitting and said body for limiting the telescopic movement of the fitting in said bore.

13. A freight bracing system for holding articles of freight in stowed positions comprising spaced oppositely disposed surfaces, each of said surfaces being provided with patterns of holes which patterns are aligned on said spaced surfaces, and each said pattern comprising three laterally spaced, parallel, substantially straight rows of regularly spaced holes, corresponding holes in said respective rows lying in lines at right angles to the length of the rows, a freight bracing bar extending between and being supported at its ends in aligned holes on said spaced surfaces, said bar comprising an elongated body having fittings adjacent the respective ends of the body each of which has a pair of pins which enter selected pairs of said holes to secure the bar in place, the pins of each said pair being rigid with the corresponding fitting and projecting parallel to each other and being located on opposite sides of the fitting, said pins being laterally spaced from each other by a distance equal to twice the distance between said rows and also equal to a multiple of the spacing between the holes in each row, so that each pair of pins can be inserted into corresponding holes in the outer ones of said three rows and can also be inserted in a pair of holes in each said row having at least one hole lying midway therebetween, at least one of said fittings having a latching lever carried thereby for movement between latching and releasing positions including a latch pin extending parallel to the rigid pins on said one fitting and located approximately midway between the rigid pins on said one fitting and approximately in a plane defined by the rigid pins on said one fitting for entering an intermediate hole lying between the holes entered by said rigid pins, said latch pin having a transverse locking surface thereon for engaging behind a said surface when the latch pin extends through a said intermediate hole, spring means acting between the lever and said one fitting and biasing said latch pin toward the latching position, said latch pin being movable against the opposition of said spring means to the releasing position in which it can be projected into and withdrawn from a said intermediate hole, thereby enabling said one fitting to be moved toward a said surface to project its rigid pins and said latch pin through the pair of holes and intermediate hole and enabling the transverse shoulder on the patch pin to engage behind a said surface and prevent withdrawal of the pins from said holes.

14. A freight bracing bar for extending between and being supported at its ends in holes in spaced support surfaces, said bar comprising an elongated body having attachment means adjacent respective ends of the body for entry into selected said holes to secure the bar in place, at least one of said attachment means comprising three laterally spaced pins which project outwardly from the body and parallel to each other and lie in substantially a common plane, said pins being adapted to extend into spaced holes in a said support surface, at least one of said three pins being movable and constituting a latch pin and having a transverse locking surface thereon for engaging behind said support surface when the latch pin extends through a hole, spring means acting against the latch pin to bias it to a position in which it partially but not completely registers with a hole when at least one of the other pins completely registers with a hole, said latch pin being movable against the opposition of said spring means to a position in which it registers with its said hole, thereby enabling said bar to be moved toward said surface to thereby project said pins through said holes and to cause the latch pin to engage behind the said surface and prevent withdrawal of the pins from the holes.

15. A freight bracing member for extending between and attachment to spaced support structures at least one of which has a row of holes therein comprising a body having a longitudinal axis, means adjacent at least one end of the body selectively engageable and disengageable with said support structure so as to transmit loads on the member into the support structure and prevent inadvertent removal of the member from the support structure, said means comprising three pins projecting from the body for extending simultaneously into separate said holes in the said support structure, two of said pins being fixed against pivotal movement in all directions transverse to said longitudinal axis, the other of said pins being a latch pin movable with respect to said axis between a retracted position and a latching position, said movable pin having a latching surface thereon for engaging behind said support structure when said movable pin extends through one said hole in said structure and said movable pin is in said latching position, yieldable means biasing said movable pin to said latching position in which it partially but not completely registers with said one hole when the fixed pins completely register with two other said holes, said movable pin being movable against the opposition of said yieldable means to said retracted position in which it registers with said one hole, and common means mounting said three pins on said body for telescopic movement parallel to said longitudinal axis.

16. A freight bracing bar for attachment to a support structure having at least three holes therein comprising an elongated body having a longitudinal axis, means adjacent at least one end of the body selectively engageable and disengageable with said support structure so as to transmit loads on the bar into the support structure and prevent inadvertent removal of the bar from the support structure, said means comprising three pins projecting

from the body for extending simultaneously into separate said holes in said support structure, two of said pins being fixed against pivotal movement in all directions transverse to said longitudinal axis, the other of said pins being a latch pin movable with respect to said axis between a retracted position and a latching position, said movable pin having a latching surface thereon for engaging behind said support structure when said movable pin extends through one said hole in said structure and said movable pin is in said latching position, and yieldable means biasing said movable pin to said latching position in which it partially but not completely registers with said one hole when the fixed pins completely register with two other said holes, said movable pin being movable against the opposition of said yieldable means to said retracted position in which it registers with said one hole.

17. A freight bracing member for extending between and attachment to each of a pair of spaced support structures at least one of which has at least three spaced holes therein comprising an elongated body having a longitudinal axis, means adjacent one end of the body selectively engageable and disengageable with said one support structure so as to transmit loads on the member into said one support structure and prevent inadvertent removal of the member t efrom, said means comprising three pins projecting from the body for simultaneously extending into and occupying said three holes in said one support structure when the member is attached to said one structure, two of the pins being fixed against pivotal movement in all directions transverse to said longitudinal axis, the other of the pins lying between the two pins and being a latch pin movable with respect to said axis between a retracted position and a latching position, the movable pin having a latching surface thereon for engaging behind said one support structure when the movable pin extends through a said hole in said one structure and the movable pin is in said latching position, and yieldable means biasing the movable pin to its latching position in which it partially but not completely registers with said last mentioned hole when the fixed pins completely register with two other said holes, the movable pin being movable against the opposition of the yieldable means to said retracted position in which it registers with a said one hole, and means adjacent the other end of the member for connecting the other end thereof to the other support structure to transmit loads from the member into said other support structure.

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FREIGHT LOADING APPARATUS

Original Filed Nov. 27, 1951 6 Sheets-Sheet 1

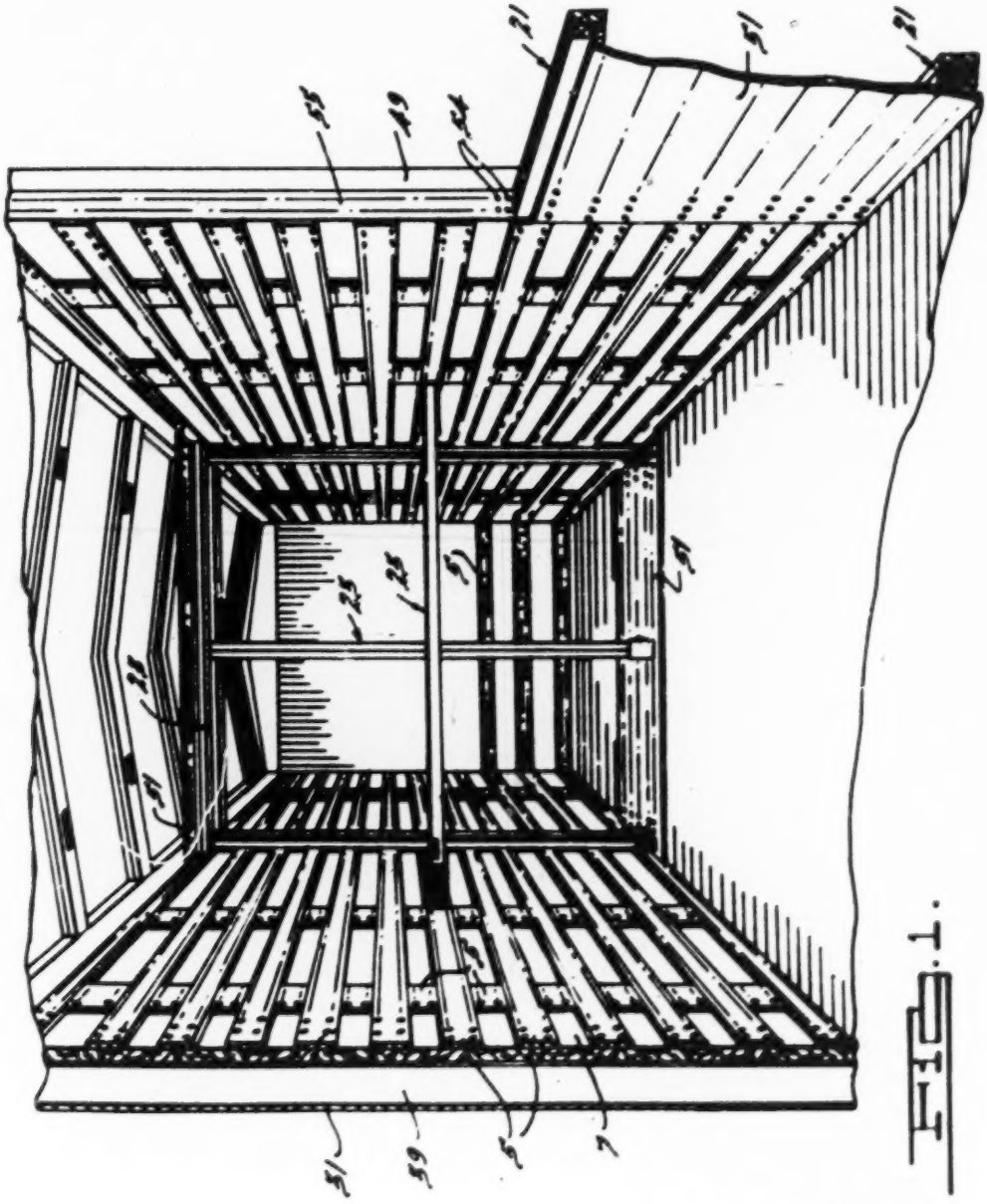

Fig. 1.

INVENTOR.
Kenneth J. Tobin
BY
Harness, Dickey, Pierce.
ATTORNEYS

Feb. 17, 1959 K. J. TOBIN 2,873,695

FREIGHT LOADING APPARATUS

Original Filed Nov. 27, 1951 6 Sheets-Sheet 2

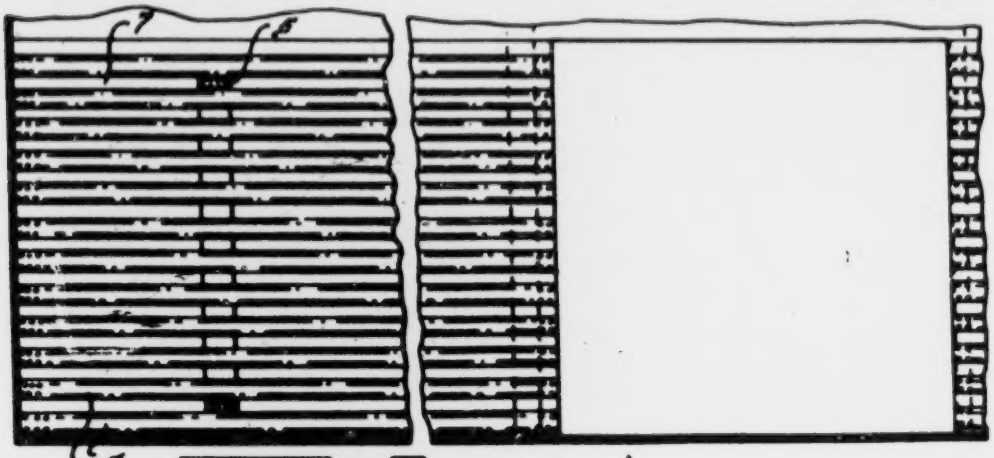

Fig. 2.

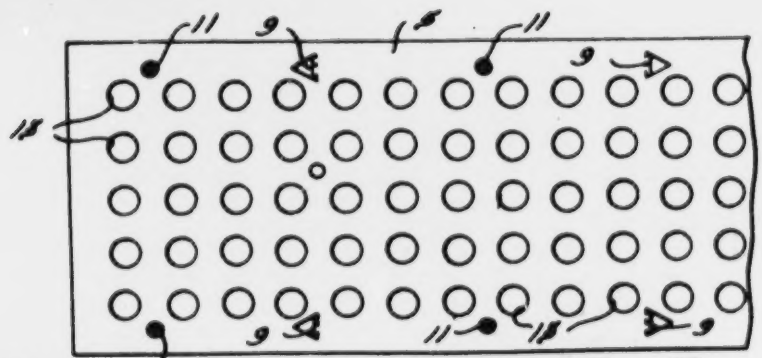

Fig. 3.

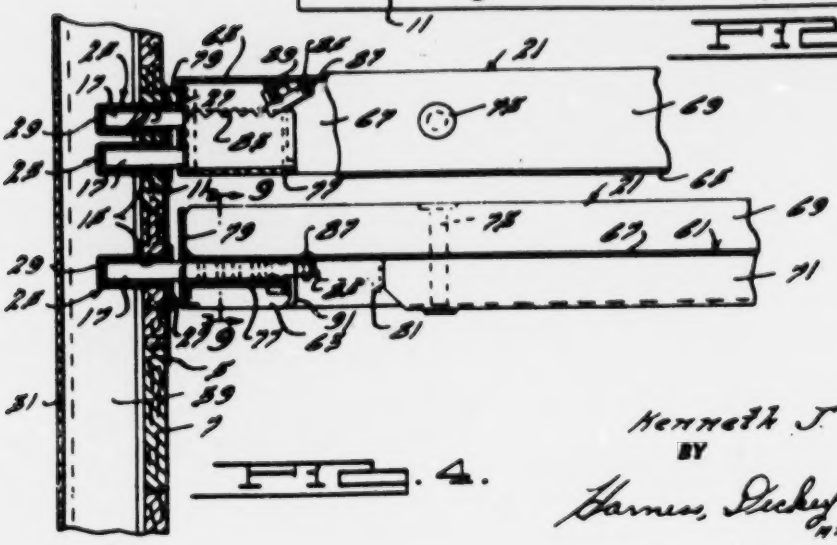

Fig. 4.

INVENTOR.
Kenneth J. Tobin
BY
Harness, Dickey & Pierce.
ATTORNEYS

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FREIGHT LOADING APPARATUS

Original Filed Nov. 27, 1951 6 Sheets-Sheet 3

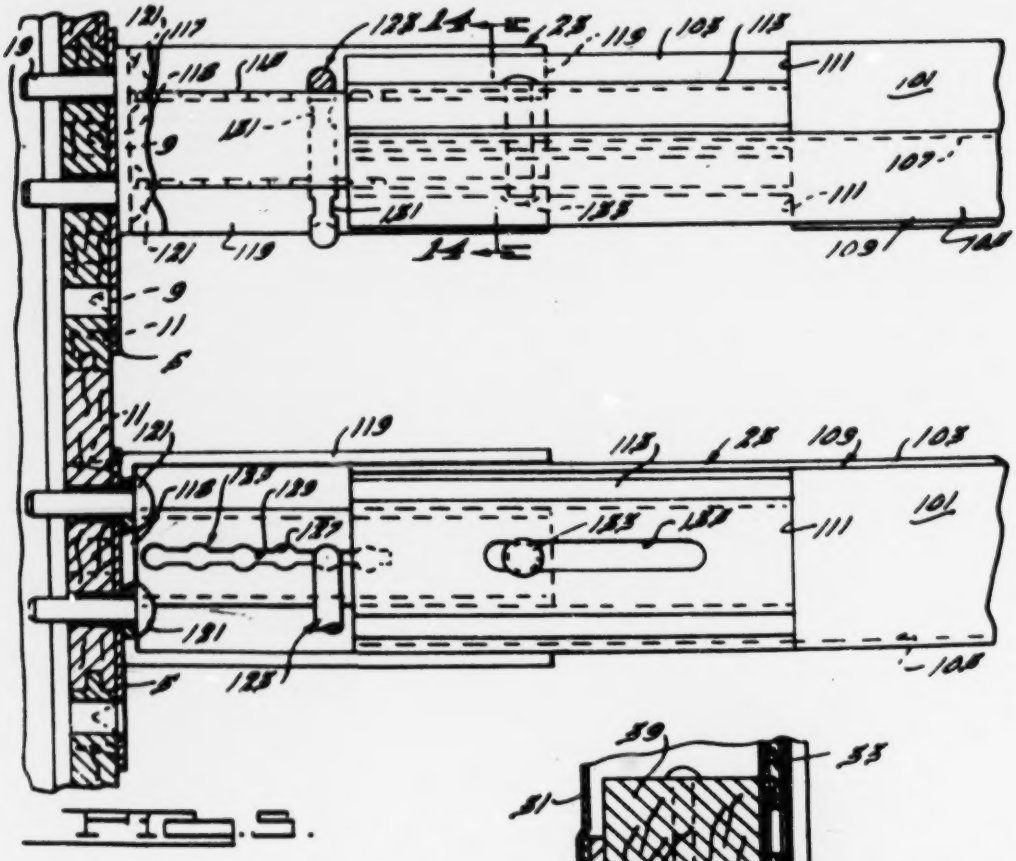

FIG. 5.

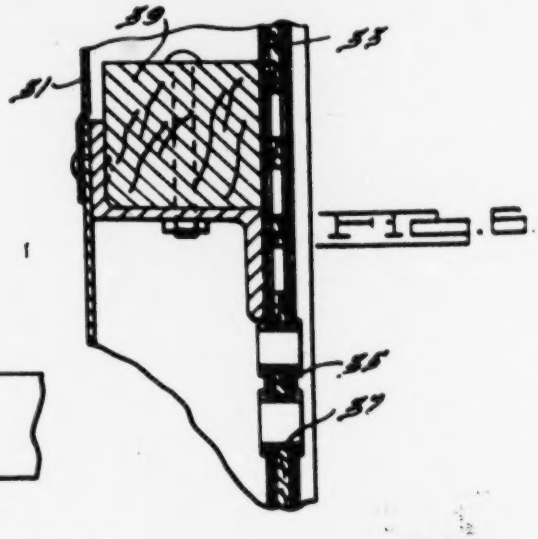

FIG. 6.

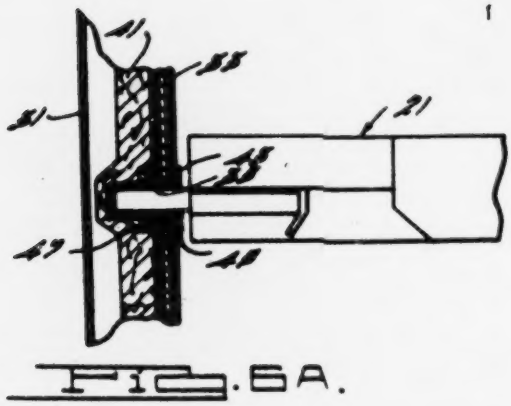

FIG. 6A.

INVENTOR.
Kenneth J. Tobin
BY
Harness, Dickey, Pierce.
ATTORNEYS

Feb. 17, 1959 **K. J. TOBIN** **2,873,695**

FREIGHT LOADING APPARATUS

Original Filed Nov. 27, 1951 6 Sheets-Sheet 4

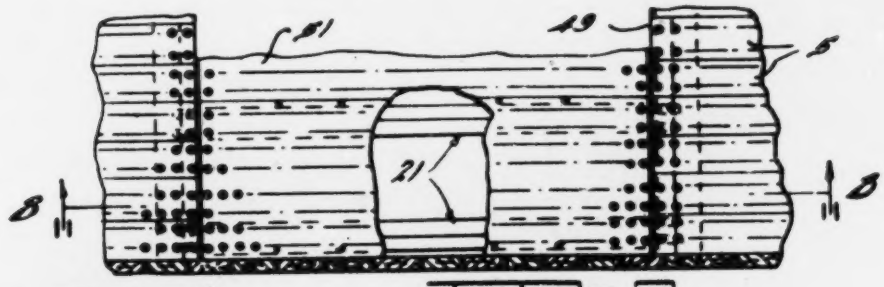

FIG. 7.

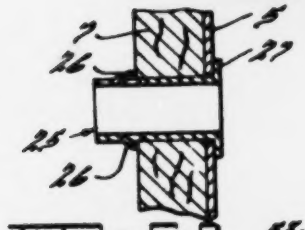

FIG. 6B.

FIG. 6C.

FIG. 8.

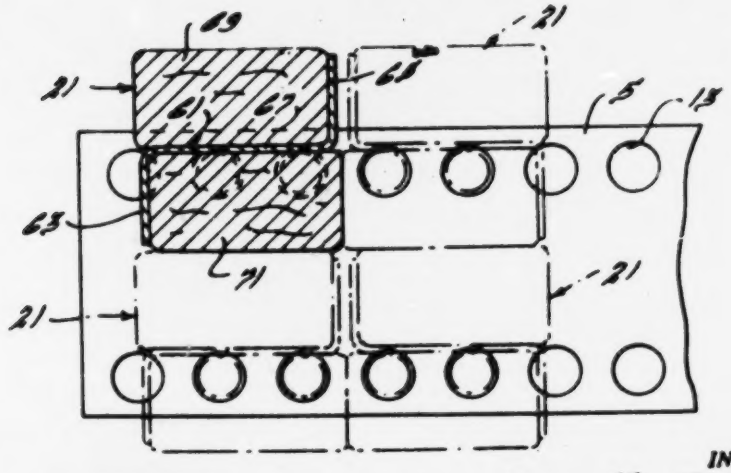

FIG. 11.

INVENTOR.
Kenneth J. Tobin
BY
Harness, Dickey & Pierce.
ATTORNEYS

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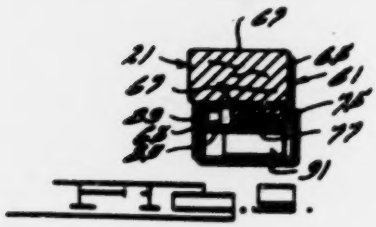

FIG. 9.

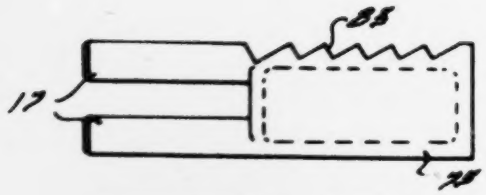

FIG. 10.

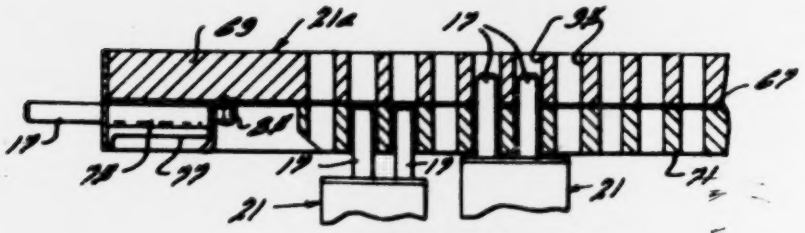

FIG. 12.

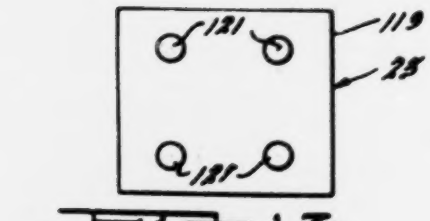

FIG. 13.

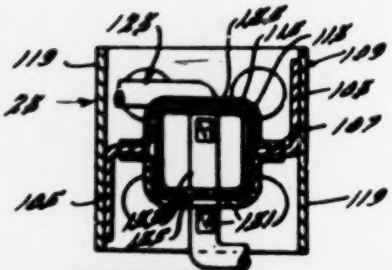

FIG. 14.

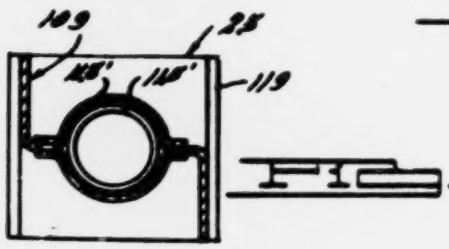

FIG. 15.

INVENTOR.
Kenneth J. Tobin
BY
Harness, Dickey & Pierce
ATTORNEYS

Feb. 17, 1959 K. J. TOBIN 2,873,695

FREIGHT LOADING APPARATUS

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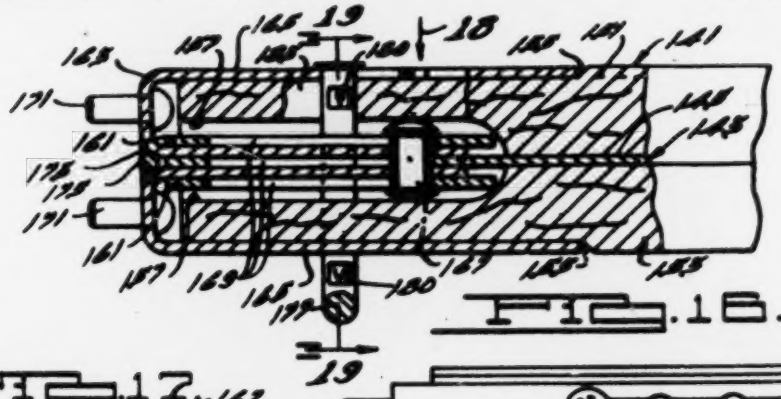

FIG. 16.

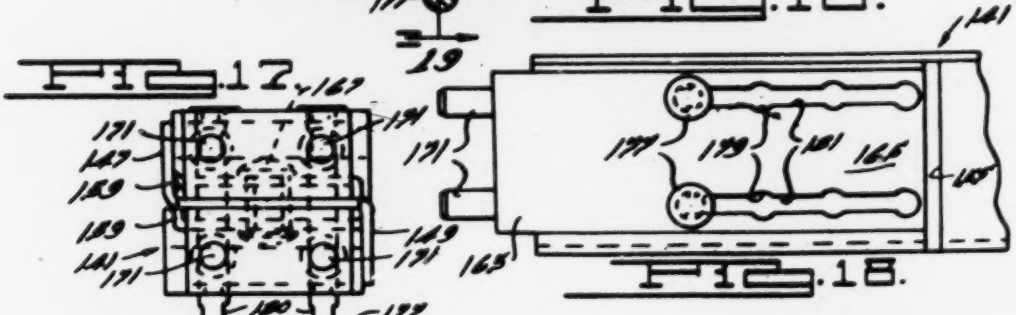

FIG. 17.

FIG. 18.

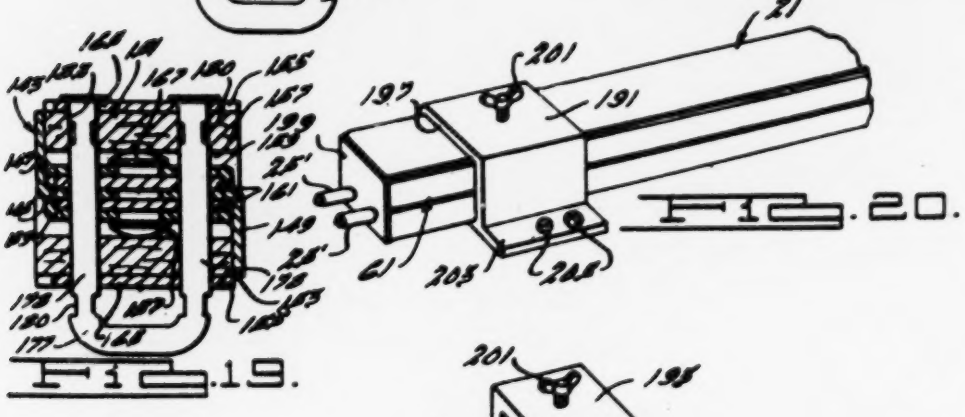

FIG. 19.

FIG. 20.

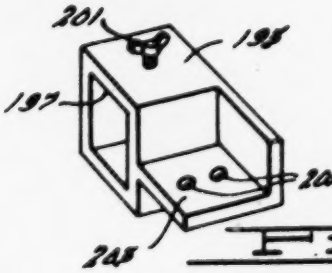

FIG. 21.

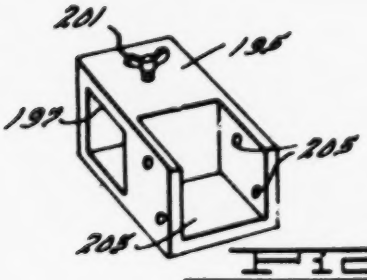

FIG. 22.

INVENTOR.
Kenneth J. Tobin
BY
Harness, Dickey & Pierce.
ATTORNEYS

United States Patent Office

2,873,695

Patented Feb. 17, 1959

2,873,695

FREIGHT LOADING APPARATUS

Kenneth J. Tobin, Sarasota, Fla., assignor to Evans Products Company, Plymouth, Mich., a corporation of Delaware

Continuation of application Serial No. 258,403, November 27, 1951. This application January 24, 1956, Serial No. 561,826

12 Claims. (Cl. 105—369)

The present application is a continuation of applicant's copending application Serial No. 258,403, filed November 27, 1951. Claims to subject matter disclosed but not claimed herein are presented in a divisional application Serial No. 694,249, filed on November 4, 1957.

This invention relates to freight loading apparatus which may be installed in transport vehicles such as railroad cars.

It is an object of this invention to provide freight loading apparatus which may be readily installed on the wooden lining or inner wall of existing type freight cars.

Another object of the invention is to provide freight loading apparatus of such a nature that when the movable parts are removed an ordinary, as distinguished from a "special," freight car remains.

Another object of the invention is to provide freight loading apparatus which is substantially dunnage free and which does not substantially decrease the inside dimensions of the freight car.

Another object of the invention is to provide freight loading apparatus which is at least as adjustable as the freight loading apparatus known heretofore, but which is appreciably less expensive to manufacture and install.

Another object of the invention is to provide freight loading apparatus which is especially well adapted for use in insulated chambers such as refrigerator cars.

Another object of the invention is to provide an improved cross bar which may be supported so that any one of its four sides will engage freight and in which the support means is offset relatively to said sides and located different distances from each.

A further object is to provide means in which a cross bar having different section moduli or resistance to bending in two mutually perpendicular directions may be rotated about its length so that the desired section modulus may be used against the load.

A further object is to provide a freight bracing bar having support means at opposite ends thereof having portions extending longitudinally therefrom for nonrotatably attaching the bar to support structures in a plurality of axially rotative angular positions of the bar to advance each freight engaging surface of the bar toward the freight in increments, the support means having a center which is offset with respect to the longitudinal axis of the bar and located different distances from each of the freight engaging surfaces of the bar and in an area enclosed by the bar body, i. e., by all sides of the bar body, including the freight engaging surfaces of the bar body, so that the bar and support means can be rotated together about the longitudinal axis of the bar and the support means engaged with the support structures in each one of the plurality of axially rotative angular positions.

The invention contemplates the use of suitably strengthened holes in the conventional wooden inner wall of a double-wall freight car to support cross bars extending transversely of the car. The cross bars are provided

with axially extending pins which project into these holes to support the cross bars on the walls. The pins are eccentric with respect to the geometric axis or center line of the bar. Thus, by turning the bar angularly in 90° increments the four side faces thereof will occupy four different positions and different section moduli will be presented to the load.

There are other objects and features of the invention and these, as well as the preceding, will appear upon consideration of the accompanying drawings, in which:

Figure 1 is a perspective view of the interior of a freight car embodying the invention and looking lengthwise of the freight car, the thickness of the metal strips 5 being substantially exaggerated;

Fig. 2 is a vertical section lengthwise of a freight car embodying the invention with parts broken away;

Fig. 3 is a plan view of a suitable plate that may be mounted on the inner wooden wall of a freight car in the practice of the invention;

Fig. 4 is a vertical section through the inner and outer side walls of a freight car and shows a preferred form of cross bar mounted on the wall in two positions which are spaced 90 degrees from each other;

Fig. 5 is a view similar to that of Fig. 4 showing a different form of cross bar and the use of the metal plate alone without sleeves inserted in the holes in the wooden lining;

Fig. 6 illustrates the substitution of a composite metal and wood lining for the normal wooden lining of the freight car, the substituted lining being provided with holes for supporting the cross bars;

Fig. 6A illustrates the use of the composite lining of Fig. 6 with an insulating barrier wherein a closed-end thimble is used to provide a seal between the inside of the car and the space between the inner and outer wall;

Fig. 6B shows a thimble having tangs formed in it whereby it may be used to hold the metal strip in place, the tangs serving to prevent the thimble from backing out;

Fig. 6C shows the use of a thimble without a reinforcing strip;

Fig. 7 is a vertical section through a portion of a freight car with parts broken away and parts removed and shows a method of bulkheading the doorway of the car;

Fig. 8 is a section taken on the line 8—8 of Fig. 7;

Fig. 9 is an end view of the cross bars shown in Fig. 4;

Fig. 10 is a detail plan view of the bolt used in the cross bars of Figs. 9 and 4;

Fig. 11 is a cross section through the cross bar of Fig. 4 when it is mounted on one of the plates and shows in phantom lines how the effective section of the cross bar may be built up by the use of other cross bars;

Fig. 12 is a cross section through a modified form of the cross bar of the type shown in Fig. 4 wherein the body of the bar is provided with transverse apertures which receive the projecting pins on the ends of other cross bars;

Fig. 13 is an end view of the cross bars shown in Fig. 5;

Fig. 14 is a section taken along the line 14—14 of Fig. 5;

Fig. 15 is a section similar to Fig. 14 showing the modified form of cross bar;

Fig. 16 is a section through the end of a cross bar which is generally similar to the cross bar of Fig. 5 but showing a modified construction;

Fig. 17 is an end elevation taken from the left of Fig. 16;

Fig. 18 is a plan view of structure shown in Fig. 16;

Fig. 19 is a section taken on line 19—19 of Fig. 16;

Fig. 20 is a perspective view of a cross bar having slid-

ably mounted thereon a fixture for holding special loads; and

Figs. 21 and 22 are perspective views of other forms of fixtures which may be mounted on the cross bar in the manner shown in Fig. 18.

As best seen in Figs. 1 and 2, the preferred form of the invention contemplates the attachment of a series of thin metal strips 5, preferably about one-eighth of an inch in thickness, to the inside face of the usual wood tongue and groove inside wall or lining 7 of the freight car. Though the strips may be wider or smaller, they are preferably about 6 inches in width and as long as possible consistent with reasonable ease in handling and installation. As seen from an enlarged view of one of the plates in Fig. 3, they preferably have non-skid tangs 9 sheared out and bent normal to the main body of the strip which serve as a means for temporarily attaching the strips to the wooden walls of the car. The tangs will hold the strips 5 in place while screws 11 are inserted through suitable holes in the plate to thread into the wooden lining 7 and permanently secure the strips in place. The strips 5 preferably have a series of holes 13 formed therein by a suitable punching operation prior to their mounting on the wall 7 of the freight car. These holes may be of a size and location that vary widely from the arrangement shown in Fig. 3 and may, for example, be ¾ of an inch in diameter with the center spaced an inch and a half apart and arranged in horizontal and vertical rows. After the strips 5 have been mounted on the walls 7, they serve as convenient templates or drill guides for the gang drilling of holes 15 in the wooden lining 7.

Figs. 1 and 2 illustrate the use of plates 5 wherein they extend horizontally throughout the length of the car and are spaced vertically from each other. These figures also show the use of strips 5 arranged to extend vertically. It will be appreciated that the spacing between adjacent strips may be varied, as desired, and may be unequal, e. g., closer together in the lower half of the freight car to accommodate more common types of loading, or may be fitted against each other to completely cover the face of the lining 7, as shown in Fig. 7. Inasmuch as the plates or strips 5 are ordinarily no thicker than about ⅛ of an inch, it will be seen that their attachment to the linings 7 does not result in any significant decrease in the inside dimension of the car and, furthermore, that a substantially flush wall having no harmful projections is retained. Furthermore, when compared with prior freight loading systems, it will be seen that the dead weight is practically eliminated.

The holes 13 which are formed in the plate and the aligned holes 15 in the wood lining receive and support suitable axially projecting bearing surfaces on the ends of cross bars that traverse the interior of the freight car. The cross bar bearing surfaces are preferably in the form of cylindrical pins 17 and 19, as will be readily observed in Figs. 4 and 5, on the ends of the cross bars 21 and 23, respectively. There is sufficient clearance between the walls of the holes and the pins 17 and 19 to take care of the usual misalignments and since each of the holes are spaced equal distances from one another, each hole of each row has another hole in the same row spaced therefrom a distance equal to the spacing between two of the rows, it is apparent that the pins 17 and 19 can be inserted within a pair of vertical holes and also in one of the vertical holes and another hole in the same horizontal row. With this construction, when the line joining the center of pins 17 and 19 as viewed from the end of the bar and a perpendicular bisector of such line are both laterally displaced from the longitudinal axis of the bar, as will be described hereinafter, the bar can be rotated through four 90° increments to selectively present each freight engaging face of the bar toward the freight at different laterally spaced parallel positions.

The major loads applied to the cross bars are lengthwise of the freight car and are occasioned by impact upon starting or stopping the car. These loads are transmitted through the bearing pins 17 or 19 to the walls of the holes 13 and 15. Inasmuch as the wood of the lining 7 is relatively soft, it will serve to some extent to cushion the loads as well as to dampen vibratory tendencies of the cross bar. The loads lengthwise of the freight car are in large measure transmitted to the strips 5 which also extend lengthwise of the freight car in the preferred embodiment. The load on the edge of any one hole 13 is therefore distributed over a wide area of the metal plate 5, and it will be recognized that the plate 5 acts as a tension member to react against the loads placed on the cross bars 21 or 23. The load in the plates 5 is transmitted into the side wall lining 7 through the tangs 9 and the screws 11 but, in view of the large areas involved as compared with the wall of a single hole 13, the unit stress will be relatively small.

Particularly, when heavier loads are expected to be handled, it is preferable to place sleeves or thimbles 25 in the holes 13 and 15, such as the closed-end thimbles shown in Fig. 4. These may be provided with radial flanges 27 that are welded or otherwise suitably secured to the side faces of the plates 5. The thimbles 25 will take the wear which would normally be applied to the edges of the holes 13 and 15 and yet will not interfere with the advantages of load distribution as mentioned hereinbefore. It will be seen that because of the closed ends 29 the thimbles 25 are constructed so that they provide a chamber for the pins which is sealed from the space between the inner wall 7 and the outer wall 31 of the freight car. Thus, if the space between the inner and outer walls is intended to serve as an insulating barrier, the present freight loading apparatus will not increase the rate of heat transfer between the inside and outside of the car.

It is, of course, within the broad purview of the invention to use the thimbles 25 without the strips 5 (Fig. 6C).

While it is preferred to attach plates 5 to the existing wooden linings 7 in a freight car, the invention may also be embodied in a freight car having a composite lining 33 substituted for the wooden lining 7 as shown in Figs. 6 and 6A. The lining 33 can be made up of thin sheets of metal on the inner and outer faces and sheets of metal on the inside alternated with thin layers of wood so as to provide composite metal and wood construction. With this type of construction, the thickness of the inner wall, i. e., wall 33, can be reduced somewhat over that of the normal wood lining 7 with the result that the inside dimensions of the car is actually increased even though it is still adapted for freight loading apparatus. The composite lining 33 is preferably provided with holes 35 that extend through it and these preferably contain linings such as the sleeve 37 shown in Fig. 6. The sleeve may have its ends turned over to form radial flanges by means of which it is secured to the lining 33, this operation being done before the lining 33 is attached to the conventional longitudinally spaced upright posts 39 of the car.

In case the space between the inner and outer walls 31 and 33 is used for insulation, as shown by the insulating material 41 in Fig. 6A, it is preferable that the linings for the holes 35 be thimbles having closed ends such as the thimble 43. This thimble has a radial flange 45 which bears against the inside face of the lining 33 and the body of the thimble may be threaded to receive a nut 47 on the outside face of the lining 33 whereby the thimble is clamped tightly in place on the plate, this operation being done before the plate 33 is mounted in the freight car.

It will be appreciated that it is within the scope of the invention to simply press-fit the sleeve or bushing in the hole 35 or 15. Also resilient tangs 26 may be formed in the side walls of the thimbles 25 to spring out behind the wood linging 7 (Fig. 6B) whereby they serve to hold the thimble 25 and strip 5 in place on the lining or alter-

nately threads could be rolled into the outer diameter of the thimble so that it could screw into the wooden lining.

As shown in Figs. 7 and 8, the perforated plates may be used as bulkheads for the doorway 49 of the freight car. For this use, the plates 51 may be used instead of plates 5 and they are preferably substantially wider, a suitable width being 24 inches. The doorway 49 is preferably made the same width as the inside of the freight car. When this is done, the plates 51 may be used to bulkhead the door and may also be placed on the floor of the freight car transversely of the width of the car, as shown in Fig. 1. This arrangement also permits the cross bars 21 or 23, which span the transverse width of the freight bar, to be used to support the plates 51. For this purpose, the door posts 53 on either side of the door opening 49 are provided with vertical rows of apertures 54 to receive the pins 17 or 19 on the ends of the cross bars. The posts 53 are ordinarily made up of a substantially channel-shaped metal facing 55 which protects the major wooden body of the post. The tangs 9 or the screws 11 may be used as means for securing the plates 51 to the cross bars and the arrangement is preferably such that the plates 51 are flush with the inside lining of the car as illustrated in Figs. 1 and 8. It will be seen that, since the cross bar is on the outside of the plate 51, loads within the freight car tend to hold the plates in place. In the event that grain or other fluid material is carried within the freight car, paper or the like can be used to cover the openings in the plates 51. Obviously, the plates 51 could be eliminated and other types of bulkheading utilized in conjunction with the cross bars which extend between the door posts 53.

As shown in Fig. 1, the deckboards 51 can be used to form a ceiling for the freight car and may be supported for this purpose by vertical and horizontal cross bars as illustrated. It will also be appreciated that cross bars and deckboards can be used together to provide bins and compartments within the car and between the side walls thereof. For example, the deckboards can be extended vertically and longitudinally of the car and intermediate the side walls, so as to divide the width of the car, as by supporting them on vertical cross bars such as the bar 23 shown in Fig. 1. As will appear later, the cross bar 21a of Fig. 12 can also be advantageously employed in these arrangements and for bracing lading at intermediate positions within the car.

The construction of the cross bar 21 is best illustrated by reference to Figs. 4 and 9–11. This bar has the conventional Z-shaped metal reinforcing bar 61 with side legs 63 and 65 that extend in opposite directions from the transverse connecting web 67 with the result that there will be a different section modulus in a direction parallel to the side legs 63 and 65 than there is in a direction parallel to the web 67. Wooden 2 x 4's (or pieces of other suitable size) 69 and 71 are mounted on the bar 61 on opposite sides of the connecting web 67. Bolts 73 may be used to tightly clamp the wooden bars 69 and 71 against the web 67. The axially projecting pins 17 are preferably formed as an integral part of a sliding bolt 75 which is supported between the web 67 and a retainer plate 77 that is welded to the leg 63 and bottom of leg 65 and to an end plate 79 likewise welded to the end of the reinforcing bar 61. The bolt 75 and retainer 77 fit in a space beneath the web 67 which is provided by terminating the wooden bar 71 inwardly of the end of the cross bar as shown at 81. The end plate 79 has holes in it which slidably pass the pins 17 but the plate serves to prevent movement of the bolt 75 beyond the end of the bar 21. Movement inwardly of the bar toward the withdrawn dotted line position is prevented by a ratchet means which preferably includes the teeth 83 that are formed on the side of the bolt 75 and engage a dog 85 that is pivoted by pin 87 to the web 67 and held pressed against the bolt by a spring 89 confined between it and the leg 63 of the reinforcing bar 61. The bolt 75 has a downwardly extending flange 91 that is accessible from the bottom of the bar when it is mounted as shown in Fig. 4 and which may be grasped in order to retract the bolt after the dog 85 has been pried away from the teeth 83

It will be seen that the two pins 17 define an axis or have a center of attachment to linings 7 which is eccentric with respect to the center line of the bar 61 and lies in the plane of the pins 17 and midway therebetween. Various spacings can therefore be obtained by turning the bar angularly in 90° increments about its axis even though the pins are projected in the same sets of holes. In the event that an extremely strong cross bar means is needed, more than one cross bar may be used in a given locality as illustrated in Fig. 11. As shown herein, the holes 13 are arranged so that the bars 21 can be positioned in groups which engage each other to distribute the load among them. It will be noticed that by retracting the bolt, the pins 17 may be withdrawn inside of the bar 21. The other end of the bar may be provided with a similar telescopic adjustment for pins 17 or the pins may be simply affixed by means of a strap or the like to the end of the bars 61, 69 and 71 (Fig. 20).

It is contemplated that on occasion, it may be desired to use a cross bar as a support for the ends of other cross-bars. Fig. 12 illustrates a cross bar 21a which is adapted to such use by means of transverse apertures 93 formed therein through both the bars 69 and 71 and web 67. The apertures 93 will receive and support the pins 17 on the ends of cross bars 21.

Another form of cross bar 23 is shown in Figs. 5, 13 and 14. In this form, the wooden 2 x 4's 101 are supported by the legs 103 and 105 and web 107 of the Z-shaped metal reinforcement bar 109. The wooden bars 101 terminate inwardly of the end of the bar 109 as shown at 111. Extending outwardly from the ends 111 of the bars is a square tube 113 that may be formed by flanged half-tube sections welded or otherwise affixed to the web 107 of the bar 109 as shown best in Fig. 14. The web 107 may be cut out in the area covered by the tube 113 so that a second square tube 115 can readily slide therein. The tube 115 is welded or otherwise fixedly secured at its outer end 117 to the bight 118 of a U-shaped strap 119 that embraces and slidably engages the ends of the bar legs 103 and 105. Four pins or rivets 121, that are preferably located on corners of a square as shown in Fig. 13, are fixed to the bight 118 and extend outwardly of the bar to provide the bearing surfaces 119. Obviously, the rivets 121 could be located on corners of a rectangle, or otherwise, if desired. When the pins 121 define a square, the bar 23 may be turned 90 or 180 degrees to equalize wear and eliminate permanent set as well as to dispose the larger section modulus in the desired location.

It will be seen that sliding of tube 113 on the tube 115 permits the bar 23 to be adjusted in length. Various minimum length adjustments are permitted by a Z-shaped pin 123 that operates in slots 125 that are formed on the top and bottom of the tube 115. The slots have circular enlargements 127 connected by narrower passages 129 and the pin 123 has cylindrical sections which fit in the circles 127 but not in passages 129 and flats 131 which will move through these passages. Weight of the pin 123 holds the cylindrical sections in the circular holes 127 and thus the pin abuts the end of the tube 113 to prevent shortening of the bar. By lifting the pin and turning it so that the flats 131 can slide in the passages 129, the position of the pin 123 can be changed to thereby adjust the minimum length of the bar. The bar 23 is free to increase in length due to sliding of the tube 113 on tube 115 to the extent permitted by abutment of transverse pin 133 affixed to tube 115 with the outer ends of slots 135 formed in the tube 113. It will be seen that when the pin 133 is at the ends of slots 135 there is a fairly large minimum area of contact between the legs of strap 119 and the

bar legs 103 and 105, the pin 133 also preventing the separation of the strap 119 from the bar 109.

Obviously, both ends of bar 23 may be provided with a telescopic adjustment as just described or one end may be non-adjustable as provided, for example, by fixed attachment of the strap 119 with its applied rivets 121, to the other ends of the bars 101 and 109, this attachment being readily accomplished by means of welding to the legs 103 and 105 or by means of transverse bolts.

As shown in Fig. 15, which is a view similar to Fig. 14 but with parts removed, the square tubes 113 and 115 may be replaced by round tubes 113' or 115' or by tubes of other shapes, if desired.

A cross bar 141 is shown in Figs. 16 and 17 which uses standard size 2 x 4's and which has a flush outer surface throughout its entire length. In this bar, a typical Z-shaped reinforcement member 143 is used having a web 145 and legs 147 and 149. The top and bottom 2 x 4's 151 and 153 are clamped against the web and adjacent the legs by the usual through bolts (not shown). The outer face of the end of each of the wooden bars is provided with a relief 155 and the inner sides are cut away as shown at 157. A pair of angle shaped retainer pieces 159 are disposed in the cutouts 157 and the side edges thereof are welded to the legs and web respectively of the bar 143 as seen in Figs. 17 and 19. The spaces between the retainer plates 159 and the web 145 form chambers which slidably receive the inner legs 161 of a pair of U-shaped straps 163, the outer legs 165 of the straps fitting in the reliefs 155 so that they lie flush with the outer surfaces of bars 151 and 153. The legs 161 of the straps carry a transverse pin 167 that slides in longitudinal slots 169 formed in the web 145 and in the retainers 159 and which defines the minimum and maximum length of the cross bar 141. The bights of the U-shaped straps 163 have rivets 171 (substantially identical to rivets 121) affixed thereto and these are preferably located so that they define corners of a square as hereinbefore described in connection with cross bar 23. The straps 163 are preferably welded together to form a rigid unit as shown at 173, a filler rod 175 being used to facilitate the welding operation and increase the strength of the weld. A U-shaped gravity stirrup 177 may be used as a slack adjuster to correspond to member 123 and the slack adjusting system of the cross bar 23. The cylindrical legs 178 of the adjuster 177 fit in round holes 179 in the legs 165 of the straps 163 and flat sections 180 in the legs fit in passages 181 that connect the holes 179. The bars 151 and 153, the retainers 159, and the web 145 have slots 183 through which the legs 178 pass and the inner ends of the slots shoulder on the legs to limit the extent to which the cross bar can shorten. By lifting the adjuster 178 and moving the flats 180 through passages 181, its position relative to the ends of the straps 163 can be varied and thus the minimum adjusted length of the bar can be regulated to hold the cross bar locked between side walls of the car.

Figs. 20–22 illustrate the use of several fixtures 191, 193 and 195 with a cross bar, the fixtures being designed to hold special types of articles such as motors, machines, etc. Each has a rectangular hole 197 by means of which it is slidably but non-rotatably mounted on the cross bar, the non-adjustable end of a cross bar 23 having axially fixed bearing surfaces 25' carried by an end plate 199 welded to the Z-bar 61 being shown in Fig. 20. A tightening bolt or screw 201 threads through a wall of each hole 197 to serve as means for clamping it tightly on the cross bar in a fixed position. Each of the fixtures has a lateral projection 203 upon which the article to be carried rests, and to which it may be bolted, if desired, through the medium of holes 205.

It will now be realized that the present invention provides freight loading apparatus which does not reduce the inside dimension of the car and which maintains a substantially flush inside lining in the car. Furthermore, the

apparatus does not appreciably increase the dead weight of the freight car and, when the cross bars are removed substantially a regular freight car remains. The number of different parts and the weight of the apparatus have been reduced to a minimum and yet the stability of the present freight loading apparatus is comparable to that of any known loading equipment. Additionally, the apparatus is such that a flush lining may be used for special purposes such as for the loading of grain. Also, the apparatus is well adapted to use in insulated or refrigerated cars. The cross bars are such that they can stand the severe punishment to which they are subjected in actual use, such as being thrown out of the freight car so that they land on their end sections. In the form of cross bar wherein four axial pins are used, permanent set and wear on the four sides of the bar can be equalized by turning the bar 90 or 180 degrees, and this feature also permits the increased bending resistance of one side of the bar to be used either horizontally or vertically, as desired. The cross bars and the arrangement of the inside walls of the freight car are such that advantage is taken of the space between the inner and outer walls to house the axially projecting pins and, as pointed out hereinbefore, the use of the thimbles and metal strips serve to distribute load throughout wide areas of the inner lining.

It is evident that some of these benefits can be obtained by modifying the structure shown herein in accordance with the principles described above. Hence, it is not intended to limit the invention to the precise constructions which have been revealed for purpose of illustration. It will also be evident that the invention can be used to advantage in ships, trucks, warehouses, etc., all of which may, in a certain sense, be considered equivalents of a freight car.

What is claimed is:

1. A freight bracing bar adapted to extend between and be supported in regular patterns of vertically and horizontally spaced holes in opposite sides of a freight car or other freight receiving space, said bar comprising an elongated body section including a Z-shaped metal reinforcement member having a web and legs extending in opposite directions from opposite sides respectively of the web, buffer bars on opposite sides of said web and engaging said legs, said buffer bars providing said body section with four sides adapted to engage freight, adjacent sides being substantially normal to each other, and each of said sides having elongated substantially flat freight engaging surfaces extending substantially the entire length of the bracing bar, means at one end of the body section for attaching the corresponding end of the bar to a said side of a freight receiving space, said means including a pair of laterally spaced rigid pins which extend outwardly and are maintained parallel to the length of the body section and are adapted to extend into pairs of either vertically or horizontally spaced said holes to support the corresponding end of the bar on a said side of a freight receiving space, means at the other end of the body section providing a second pair of laterally spaced rigid pins extending outwardly of and maintained parallel to the length of the body section and in longitudinal alignment respectively with the first mentioned rigid pins and also adapted to extend into pairs of vertically or horizontally spaced said holes to support the other end of the bar on an opposite said side of a freight receiving space, means on the bar for permanently maintaining each of said pins parallel to the length of the bar, said pairs of pins being eccentric to the longitudinal center line of the bar so that a line joining the pins of each pair and a perpendicular bisector of such line are both laterally spaced from said center line and intersect at a point located within an area enclosed by said body section, whereby the bar can be supported in any one of four different rotative positions each differing from the others lengthwise and vertically of a said freight car or other freight receiving

space by amounts determined by said lateral spacings between said center line of the bar and said other lines.

2. A freight bracing bar adapted to extend between and be supported in regular patterns of vertically and horizontally spaced holes in opposite sides of a freight car or other freight receiving space, said bar comprising an elongated body section having four sides adapted to engage freight, adjacent sides being substantially normal to each other and each of said sides having elongated substantially flat freight engaging surfaces extending substantially the entire length of the bracing bar, a fitting at one end of the body section for attaching the bar to a said side of a freight receiving space, means mounting said fitting on said body section for movement lengthwise of the bar to thereby change the length of the bar, said fitting including means providing a pair of laterally spaced rigid pins formed thereon which extend outwardly and are maintained parallel to the length of the body section and are adapted to extend into pairs of either vertically or horizontally spaced said holes to support the corresponding end of the bar on a said side of a freight receiving space, means at the other end of the body section providing a second pair of laterally spaced rigid pins extending outwardly and maintained parallel to the length of the body section and in longitudinal alignment respectively with the first mentioned rigid pins and also adapted to extend into pairs of vertically or horizontally spaced said holes to support the other end of the bar on an opposite said side of a freight receiving space, means on the bar for permanently maintaining each of said pins parallel to the length of the bar, said pairs of pins being eccentric to the longitudinal center line of the bar so that a line joining the pins of each pair and a perpendicular bisector of such line are both laterally spaced from said center line and intersect at a point located within an area enclosed by said body section, whereby the bar can be supported in any one of four different rotative positions each differing from the others lengthwise and vertically of a said freight car or other freight receiving space by amounts determined by said lateral spacings between said center line of the bar and said other lines.

3. A freight bracing bar adapted to extend between and be supported in regular patterns of vertically and horizontally spaced holes in opposite sides of a freight car or other freight receiving space, said bar comprising an elongated body section having four sides adapted to engage freight, adjacent sides being substantially normal to each other and each of said sides having elongated substantially flat freight engaging surfaces extending substantially the entire length of the bracing bar, means at one end of the body section for attaching the corresponding end of the bar to a said side of a freight receiving space, said means including a pair of laterally spaced rigid pins which extend outwardly and are maintained parallel to the length of the body section and are adapted to extend into pairs of either vertically or horizontally spaced said holes to support the corresponding end of the bar on a said side of a freight receiving space, means at the other end of the body section providing a second pair of laterally spaced rigid pins extending outwardly and maintained parallel to the length of the body section also adapted to extend into pairs of vertically or horizontally spaced said holes to support the other end of the bar on an opposite said side of a freight receiving space, means on the bar for permanently maintaining each of said pins parallel to the length of the bar, said pairs of pins being eccentric to the longitudinal center line of the bar so that a line joining the pins of each pair and a perpendicular bisector of such line are both laterally spaced from said center line and intersect at a point located within an area enclosed by said body section, whereby the bar can be supported in any one of four different rotative positions each differing from the others lengthwise and vertically of a said freight car or other freight receiving space by

amounts determined by said lateral spacings between said center line and said lines.

4. A freight bracing system for holding articles of freight in stowed positions comprising spaced, oppositely disposed surfaces, means providing a plurality of parallel straight rows of regularly spaced holes in said surfaces which rows are aligned on said spaced surfaces, corresponding holes in said respective parallel rows lying in lines at right angles to said parallel straight rows, each hole of each row having another hole in the same row spaced therefrom a distance equal to the spacing between a pair of said rows, a freight bracing bar adapted to extend between and be supported at opposite ends in holes in said rows in respective said surfaces, said bar comprising an elongated body section having four sides adapted to engage freight, adjacent sides being substantially normal to each other and each of said sides having elongated substantially flat freight engaging surfaces extending substantially the entire length of the bracing bar, means at one end of the body section for attaching the corresponding end of the bar to one of said surfaces, said means including a pair of laterally spaced rigid pins which extend outwardly and are maintained parallel to the length of the body section and are spaced and adapted to extend into pairs of said holes located in said rows and in said lines to support the corresponding end of the bar on a said surface, means at the other end of the body section providing a second pair of laterally spaced rigid pins extending outwardly of the body section also spaced and adapted to extend into pairs of said holes located in said rows and in said lines to support the other end of the bar on the other of said surfaces, means on the bar for permanently maintaining each of said pins parallel to the length of the bar, said pairs of pins being eccentric to the longitudinal center line of the bar so that a line joining the pins of each pair and a perpendicular bisector of such line are both laterally spaced from said center line and intersect at a point located within an area enclosed by said body section, whereby the bar can be supported in any one of four different rotative positions each differing from the others lengthwise and transversely of said rows by amounts determined by said lateral spacings between said center line and said lines.

5. A freight bracing system for holding articles of freight in stowed positions comprising spaced, oppositely disposed surfaces, means providing a plurality of parallel straight rows of regularly spaced holes in said surfaces which rows are aligned on said spaced surfaces, corresponding holes in said respective parallel rows lying in lines at right angles to said parallel straight rows, each hole of each row having another hole in the same row spaced therefrom a distance equal to the spacing between a pair of said rows, a freight bracing bar adapted to extend between and be supported at opposite ends in holes in said rows in respective said surfaces, said bar comprising an elongated body section having four sides adapted to engage freight, adjacent sides being substantially normal to each other and each of said sides having elongated substantially flat freight engaging surfaces extending substantially the entire length of the bracing bar, a fitting at one end of the body section for attaching the bar to a said surface, means mounting said fitting on said body section for movement lengthwise of the bar to thereby change the length of the bar, said fitting including means providing a pair of laterally spaced rigid pins formed thereon which extend outwardly and are maintained parallel to the length of the body section and are spaced and adapted to extend into pairs of said holes located in said rows and in said lines to support the corresponding end of the bar on a said surface, means at the other end of the body section providing a second pair of laterally spaced rigid pins extending outwardly and maintained parallel to the length of the body section and in longitudinal alignment respectively with the first mentioned rigid pins and also spaced and adapted to extend into

pairs of said holes located in said rows and in said lines to support the other end of the bar on the other of said surfaces, means on the bar for permanently maintaining each of said pins parallel to the length of the bar, said pairs of pins being eccentric to the longitudinal center line of the bar so that a line joining the pins of each pair and a perpendicular bisector of such line are both laterally spaced from said center line and intersect at a point located within an area enclosed by said body section, whereby the bar can be supported in any one of four different rotative positions each differing from the others lengthwise and transversely of said rows by amounts determined by said lateral spacings between said center line of the bar and said other lines.

6. A freight bracing bar adapted to extend between and be supported in holes in opposite sides of a freight car or other freight receiving surface, said bar comprising an elongated body section having four sides adapted to engage freight, adjacent sides being substantially normal to each other and each of said sides having elongated substantially flat freight engaging surfaces extending substantially the entire length of the bracing bar, a fitting at one end of the body section for attaching the bar to a said side of said freight receiving space, means mounting said fitting on said body section for movement lengthwise of the bar to thereby change the length of the bar, said fitting having rigid pin means formed thereon which extends outwardly and is maintained parallel to the length of the body section and is adapted to extend into said holes to support the corresponding end of the bar on a said side of said freight receiving space, but prevent rotation of the fitting about an axis parallel to the length of the bar while so supported, attachment means at the other end of the body section providing rigid pin means extending outwardly and maintained parallel to the length of the body section and in longitudinal alignment respectively with the first mentioned rigid pin means and also adapted to extend into said holes to support the other end of the bar on an opposite said side of said freight receiving space but to prevent rotation of the pin means about an axis parallel to the length of the bar while so supported, means on the bar for permanently maintaining each of said pin means parallel to the length of the bar and for preventing the rotation of said pin means, said pin means having a center which is eccentric to the longitudinal center line of the bar in a direction perpendicular to and in a direction parallel to each of said four sides and located in an area enclosed by said body section whereby the bar can be supported in any one of four different rotative positions each differing from the others lengthwise and vertically of a freight car or other freight receiving space by amounts determined by said eccentricity.

7. A freight bracing bar adapted to extend between and be supported in holes in opposite side walls of a freight car or other freight receiving space, said bar comprising an elongated body section having four sides adapted to engage freight, adjacent sides being substantially normal to each other and each of said sides having elongated substantially flat freight engaging surfaces extending substantially the entire length of the bracing bar, attachment means at one end of the body section for attaching the corresponding end of the bar to a said side of said freight receiving space, said means including rigid pin means which extends outwardly and is maintained parallel to the length of the body section and is adapted to extend into said holes to support the corresponding end of the bar on a said side of said freight receiving space, attachment means at the other end of the body section providing rigid pin means extending outwardly and maintained parallel to the length of the body section also adapted to extend into said holes to support the other end of the bar on an opposite said side of said freight receiving space, means on the bar for permanently maintaining each of said pin means parallel to the length of the bar

and for preventing the rotation of said pin means, said pin means having a center which is eccentric to the longitudinal center line of the bar in a direction parallel to and in a direction perpendicular to any one of said sides, and located in an area enclosed by said body section whereby the bar can be supported in any one of four different rotative positions each differing from the others lengthwise and vertically of the freight car or other freight receiving space by amounts determined by said eccentricity.

8. A freight bracing system for holding articles of freight in stowed positions comprising support structure including spaced apart freight bar securing means arranged in spaced apart aligned rows, a freight bracing bar adapted to extend between said rows and be supported by said securing means on said support structure, said bar comprising an elongated body having four sides adapted to engage freight, adjacent said sides being substantially flat and normal to each other and each of said sides having elongated substantially flat freight engaging surfaces extending substantially the entire length of the bracing bar, said body having section moduli designed to withstand bending loads applied respectively to adjacent of said sides, support means on the bar at opposite ends thereof having portions extending longitudinally of the bar body and operative with said securing means to nonrotatively attach the bar to a support structure in different rotative positions, said support means having centers which are offset with respect to the longitudinal axis of said bar and located diffrent distances respectively from each of the four sides and within an area enclosed by said bar body, so that said bar can be rotated through 90° to successively position said four sides to face in one direction, said sides being located in four different laterly spaced parallel positions when facing in said one direction.

9. A freight bracing bar adapted to extend between and be supported at opposite ends on support structure, said bar comprising an elongated body having a plurality of elongated substantially flat freight engaging sides extending substantially the entire length of the bracing bar, support means on the bar at opposite ends thereof having portions extending longitudinally of the bar body and operative to nonrotatively attach the bar to the support structure in any one of a plurality of axially rotative angular positions, said support means having a center which is offset with respect to the longitudinal axis of said bar and located different distances respectively from each one of said plurality of sides and in an area enclosed by said bar body, means on the bar for permanently fixing each of said support means against movement that is not parallel to the length of the bar, said bar being axially rotatable in angular increments to successively position each one of said plurality of sides to face in one direction, each one of said plurality of sides being located in different laterally spaced parallel positions when facing in said one direction.

10. A freight bracing system for holding articles of freight in stowed positions comprising spaced oppositely disposed support structure, a freight bracing bar adapted to extend between and be supported at opposite ends on said support structure, said bar comprising an elongated body having a plurality of elongated substantially flat freight engaging sides extending substantially the entire length of the bracing bar, support means on the bar at opposite ends thereof having portions extending longitudinally of the bar body and operative to nonrotatively attach the bar to said support structure in any one of a plurality of axially rotative positions spaced 90° from each other, said support means having a center which is offset with respect to each one of said plurality of sides and located different distances respectively from the longitudinal axis of said bar and in an area enclosed by said bar body, means on the bar for permanently fixing each of said support means against movement that is not paral-

lel to the length of the bar, said bar being axially rotatable in 90° increments to successively position each one of said plurality of sides to face in one direction, each one of said plurality of sides being located in different laterally spaced parallel positions when facing in said one direction.

11. A freight bracing bar adapted to extend between and be supported at opposite ends on support structure, said bar comprising an elongated body having a plurality of elongated substantially flat freight engaging sides extending substantially the entire length of the bracing bar, pin means on the bar at opposite ends thereof and projecting longitudinally therefrom and operative to nonrotatively attach the bar to the support structure in any one of a plurality of axially rotative angular positions, said pin means having a center which is eccentric to the longitudinal axis of said bar and located different distances respectively from each one of said plurality of sides and in an area enclosed by said bar body, means on the bar for permanently fixing each of said pin means against movement relative to the body of said bar that is not parallel to the length of the bar, said bar being axially rotatable in angular increments to rotate said pin means and to position each one of said plurality of sides to face in one direction, each one of said plurality of sides being located in different laterally spaced parallel positions when facing in said one direction.

12. A freight bracing system for holding articles of freight in stowed positions comprising spaced oppositely disposed support structure having a plurality of parallel straight rows of regularly spaced holes therein, a freight bracing bar adapted to extend between and be supported at opposite ends on said support structure, said bar comprising an elongated body having a plurality of elongated substantially flat freight engaging sides extending substantially the entire lenth of the bracing bar, pin means on the bar at opposite ends thereof having portions extending longitudinally therefrom and extendable within said holes in each of a plurality of axially rotative positions of the bar to nonrotatably attach the bar to said support structure, said pin means having a center which is eccentric to the longitudinal axis of said bar and located different distances respectively from each one of said plurality of sides and in an area enclosed by said bar body, means on the bar for permanently fixing each of said pin means against movement relative to the body of said bar that is not parallel to the length of the bar, said bar being axially rotatable in angular increments to rotate said pin means and to position each one of said plurality of sides to face in one direction, each one of said plurality of sides being located in different laterally spaced parallel positions when facing in said one direction.

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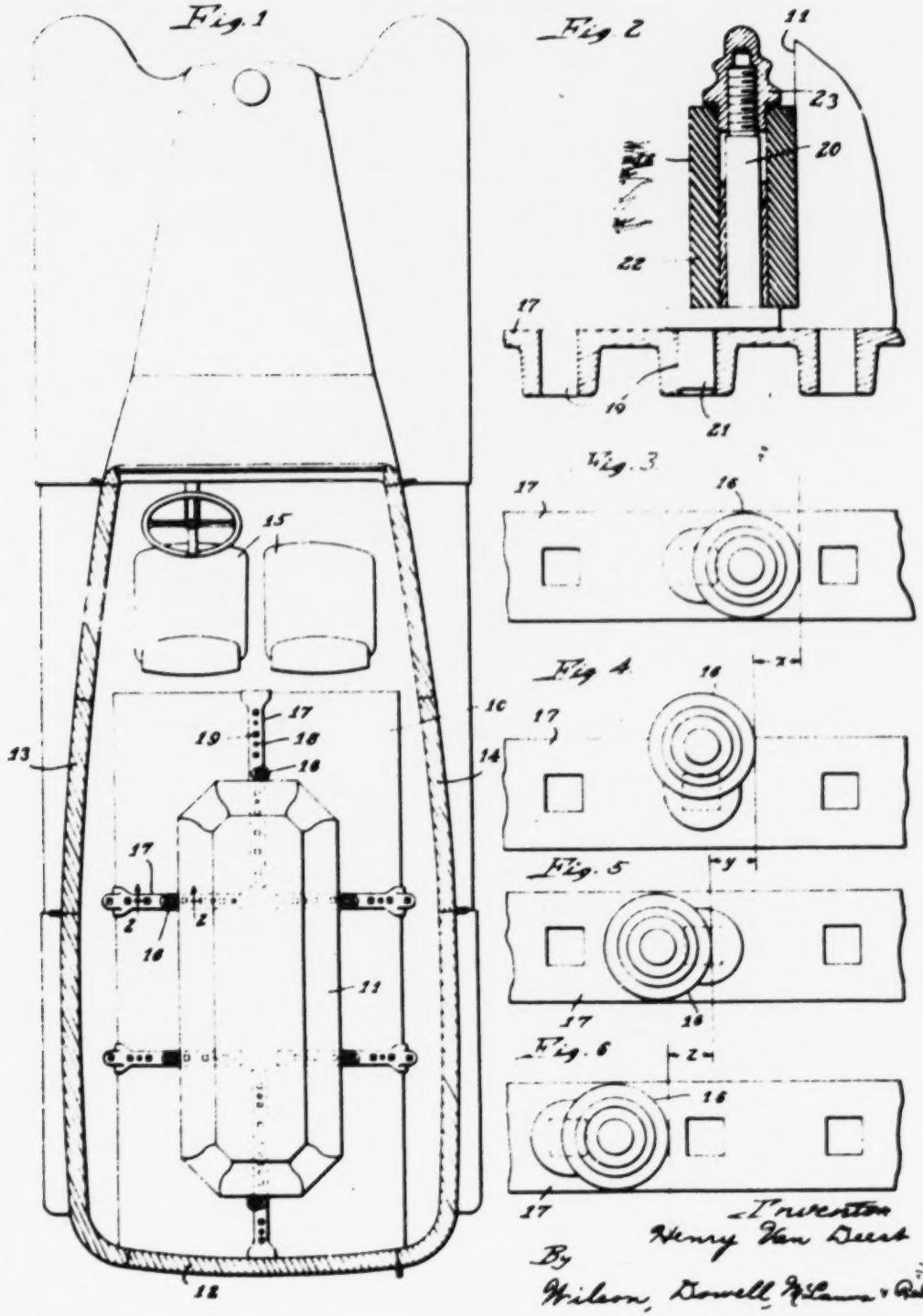
June 6, 1933. H. VAN DEEST 1,912,741

CASKET STAY FOR HEARSES

Filed March 26, 1932



Inventor
Henry Van Deest
By
Wilson, Dowell & Lane
Attys.

Patented June 6, 1933

1,912,741

UNITED STATES PATENT OFFICE

HENRY VAN DEEST, OF FREEPORT, ILLINOIS, ASSIGNOR TO HENNEY MOTOR COMPANY, OF FREEPORT, ILLINOIS, A CORPORATION OF DELAWARE

CASKET STAY FOR HEARSES

Application filed March 26, 1932. Serial No. 601,287.

This invention relates to casket stays for hearses.

The principal object of my invention is to provide casket stays in the form of pins arranged to be entered detachably in holes in plates mounted on the casket table in a hearse to hold any sized casket in position, the pins having the projecting ends thereof eccentric with respect to the shank portions so as to afford a certain range of adjustment by simply placing the pins in the holes in any desired position. In furtherance of this object, the holes in the plates are made square and the shanks of the pins of corresponding form so that the pins will hold any position in which they have been set and will positively prevent objectionable movement of the casket.

The invention is illustrated in the accompanying drawing, in which—

Figure 1 is a plan view of a hearse with the body thereof in horizontal section to show the interior and illustrating my invention;

Fig. 2 is an enlarged vertical sectional detail on the line 2—2 of Figure 1;

Fig. 3 is a plan view of Fig. 2, and

Figs. 4, 5, and 6 are similar views showing the pin in other positions of adjustment.

The same reference numerals are applied to corresponding parts.

The hearse shown in Figure 1 is of the type having a movable table 10 on which the casket 11 is placed. The table 10 is movable on ways rearwardly when the door 12 is opened or forwardly and to either side when the door 13 or 14 is opened, this hearse being known as the 3-way service type. The seats 15 are slidable forwardly out of the way to permit movement of the table out from either side of the hearse. When the casket has been placed on the table approximately in the center, pins 16 are entered in holes in plates 17 on the table to serve as stays. My invention is particularly concerned with improvements in the casket stays as hereinafter described.

The plates 17, it will be noticed, are disposed lengthwise and sidewise with respect to the casket placed on the table and are suitably secured to the table by screws 18. A series of holes 19 is provided in each of the plates evenly spaced lengthwise thereof for reception of the pins 16 in any desired positions. The pins are, of course, placed in the holes immediately alongside of the casket to hold the same in place. The plates are disposed with their inner ends quite close together so that the smallest sized casket can be held in position just as readily as the largest size. Now, there is such variation in the outside dimensions of caskets, such that one would have to locate the holes 19 too close together to properly accommodate all sizes, and even so, there would be danger of the casket being left free to move sidewise or endwise because of inability to place the pins immediately alongside the casket, due to the spacing of the holes. In accordance with my invention, the projecting or upper portion 20 of each pin is made eccentric with respect to the lower shank portion 21 arranged to fit in the holes 19 in the plate. The eccentricity is in such relation to the spacing of the holes so that it is possible to secure the same adjustment as with a plain pin arranged to be entered in holes located very close together. In other words, by simply turning the pin from the position shown in Fig. 3 to that shown in Fig. 4, an adjustment equivalent to the distance x is secured, which, it is apparent, is a small fraction of the distance between holes in the plate, and by further turning the pin from the position shown in Fig. 4 to that shown in Fig. 5, a further adjustment equivalent to the distance y is secured. Then by shifting the pin to the next hole and turning it back to the position shown in Fig. 3, a still further adjustment equivalent to the distance z is secured, and so on, the extent of adjustment in each instance being approximately one-third of the distance between the holes. The holes 19 are made square and the shanks 21 of corresponding form so that the pin cannot turn from its adjusted position. In conclusion, it will be observed that a cylindrical plug of rubber or other suitable cushioning material is mounted on each of the pins, as indicated at 22, so as to prevent marring of the casket by abrasion. The plugs 20 are freely rota-

table on the upper portion 20 of the pins so as to roll on the outside of the casket in the event of some movement thereof, and thus minimize the likelihood of marring the same. A nut 23 threaded on the upper end of the pin serves to hold the plug 22 in place.

It should be clear from the foregoing description that I have provided adjustable casket stays adapted for holding practically any sized casket or at least confining the casket within such close limits that there can be no objectionable amount of movement.

I claim:

1. Casket stay means comprising a pin plate having a series of holes provided therein spaced lengthwise thereof, and a pin having a shank portion arranged for entry selectively and detachably in any one of said holes, the upper projecting portion of the pin being disposed in eccentric relation to the shank portion, whereby to permit placing the pin in different positions in any one of said holes with the projecting portion differently located with respect to said hole for the purpose described, the holes being of polygonal form and the shank portion of the pin being conformed thereto so as to predetermine the number of different operative positions of the pin, the pin being held against turning with respect to the plate from any position in any one of said holes.

2. Casket stay means comprising a pin plate having a series of holes provided therein spaced lengthwise thereof, and a pin having a shank portion arranged for entry selectively and detachably in any one of said holes, the upper projecting portion of the pin being disposed in eccentric relation to the shank portion, whereby to permit placing the pin in different positions in any one of said holes with the projecting portion differently located with respect to said hole for the purpose described, the holes being made square and the shank portion of the pin being of corresponding form, whereby the pin is held against turning with respect to the plate from any position of adjustment.

In witness of the foregoing I affix my signature.

HENRY VAN DEEST.

May 18, 1926. 1,585,089

M. B. DISKIN

BURGLARPROOF LOCK

Filed March [illegible] 1923 2 Sheets-Sheet 1

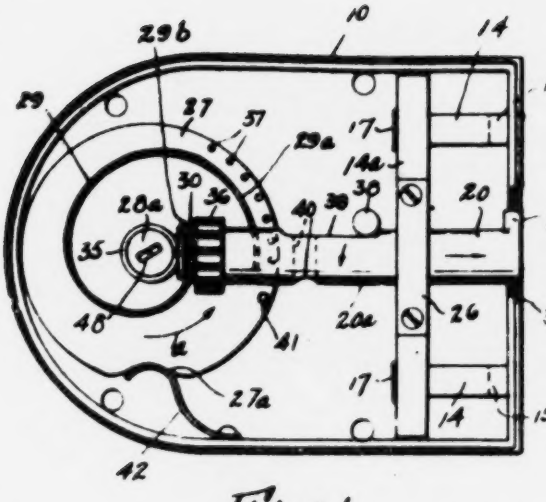


Fig. 1

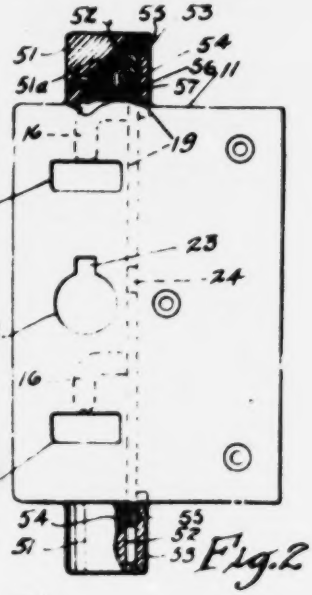


Fig. 2

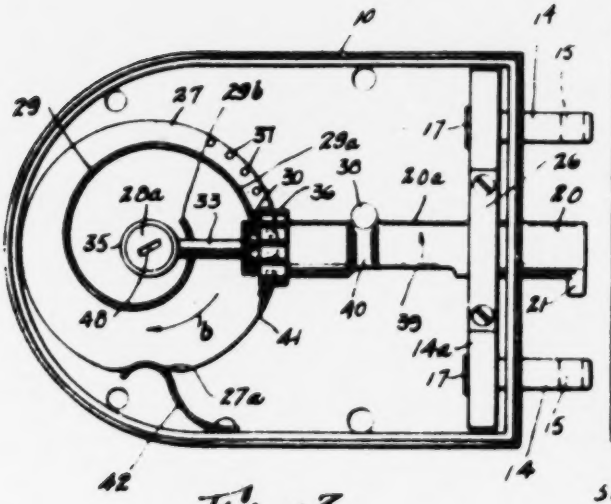


Fig. 3

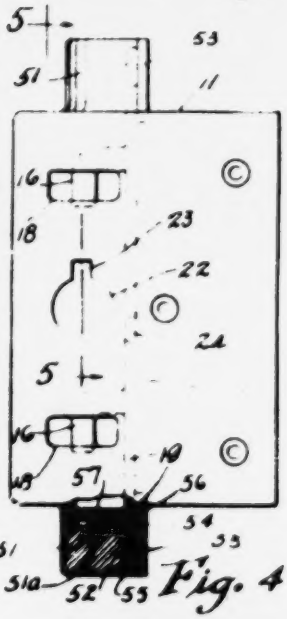


Fig. 4

INVENTOR

M. B. Diskin

BY

[illegible]

ATTORNEY

May 18, 1926.

M. B. DISKIN

1,585,089

BURGLAR [illegible]

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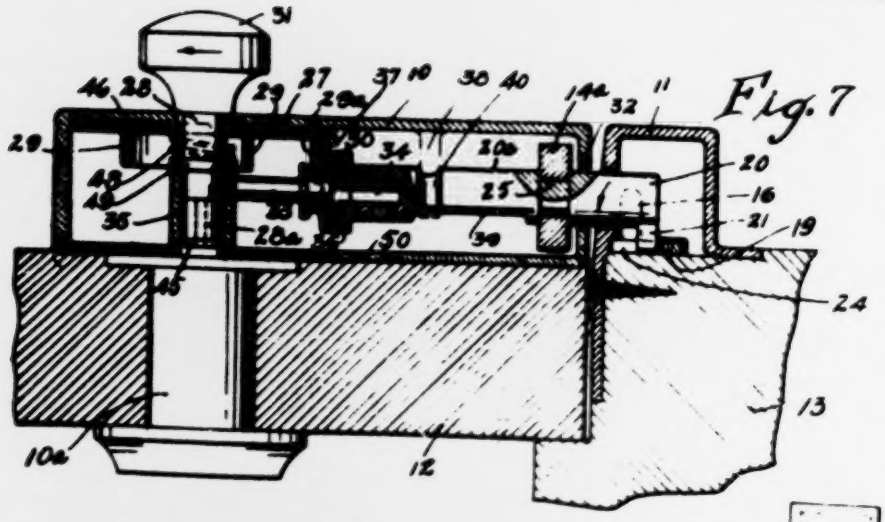

Fig. 7

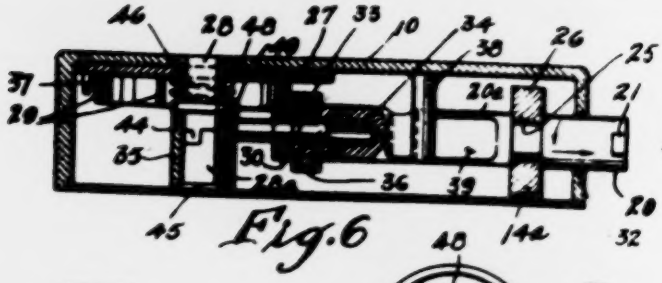

Fig. 6

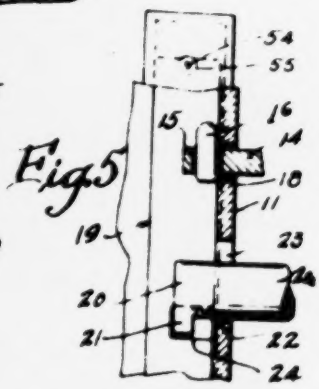

Fig. 5

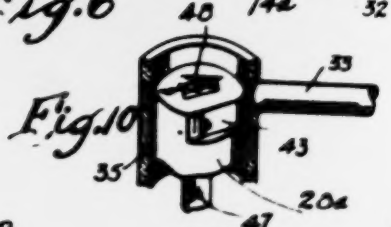

Fig. 10

Fig. 8

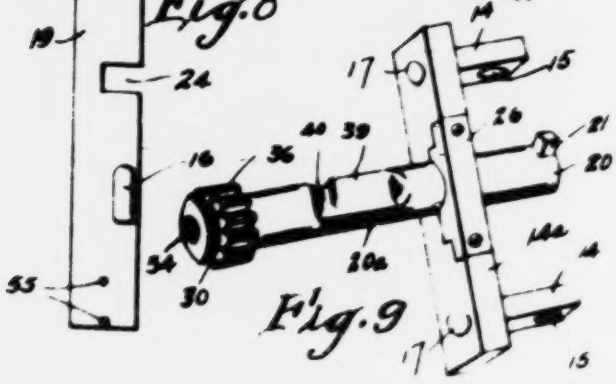

Fig. 9

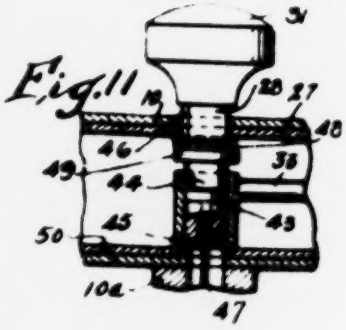

Fig. 11

INVENTOR

M. B. Diskin

BY

[illegible]

ATTORNEY

Patented May 18, 1926. 1,585,089

UNITED STATES PATENT OFFICE.

MOSES B. DISKIN, OF NEW YORK, N. Y.

BURGLARPROOF LOCK.

Application filed March 9, 1925. Serial No. 13,900.

This invention relates to builders' hardware and more particularly to locks of that character commonly designated as jimmy-proof, and adapted for use either as mortise or as rim locks.

Among the objects of this invention is to provide a jimmy-proof lock having novel bolt means including a plurality of co-operating members one of which is arranged to render said bolt means operative for locking or unlocking purposes.

Another object of this invention is to provide a jimmy-proof lock having novel bolt means and novel actuating means co-operating therewith, said bolt means being arranged to provide an operating member for co-operating with said actuating means to render the jamb piece effective for locking purposes.

With the foregoing and other objects in view the invention consists in the arrangement and combination of parts hereinafter described and claimed, and while the invention is not restricted to the exact details of construction disclosed or suggested herein, still for the purpose of illustrating a practical embodiment thereof, reference is had to the accompanying drawings in which like reference characters designate the same parts in the several views, and in which—

Figure 1 is an inside view of the lock in locked position.

Fig. 2 is an elevational view of the jamb member with parts in section, said view being taken with the jamb member mechanism ready to co-operate with the mechanism in Fig. 1, but rotated through an angle of 90°.

Fig. 3 is an inside view of the lock with the bolt projected.

Fig. 4 is a view similar to that of Fig. 2 but with the keeper in locked position.

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4.

Fig. 6 is a cross section of the lock showing an intermediate stage in the operation of the lock.

Fig. 7 is a horizontal cross section of the lock mounted upon a door showing an intermediate stage in the operation of the lock but beyond that shown in Fig. 6.

Fig. 8 is a view of the keeper.

Fig. 9 is a perspective view of the bolt mechanism.

Fig. 10 is a perspective view of a detail of the operating mechanism with parts broken away.

Fig. 11 is a sectional view of a portion of the operating mechanism similar to Fig. 7, but in a different position.

Referring now more particularly to the drawings, 10 represents a lock casing arranged to co-operate with a jamb member 11, the lock structure being arranged to be mounted either as a rim lock upon a door 12 and a jamb 13 as shown or as a mortise lock in a manner well known in the art.

Said lock comprises novel bolt means including a plurality of members one of which is operative by and in co-operation with suitable actuating means to operate the bolt for opening or closing the lock. Preferably said member is arranged for this purpose to operate a keeper as will be disclosed hereinafter. More specifically, said bolt means includes suitable engagement means such as the lugs or extensions 14 which are movable outwardly of the lock and into engagement with the jamb member mechanism. Said extensions have for this purpose preferably openings or holes 15 to engage the pins or detents 16 of the jamb member so as to cause the jamb member and the lock to co-operate with each other in a jimmy-proof manner. The engagement means or extensions 14 are projected outwardly of the lock by a carrier or cross-head 14ª which is operative by such suitable actuating means as may be arranged to secure the objects of this invention. More specifically, said cross-head is movable transversely of the lock so as to project or withdraw both of the engagement members simultaneously, said members being for this purpose secured to the cross-head preferably in a rigid manner as at 17. The jamb member is provided with openings 18 to receive said engagement members, the pins or detents 16 being movable transversely of said openings so as to enter the holes 15 of said engagement members after the same are projected into the jamb member. Said pins are movable for this purpose by suitable actuating means, and preferably by a bar or keeper 19 which is slidable along the jamb member. Said keeper is operative preferably by mechanism within the body of the lock, the bolt means being arranged to actuate the keeper to move said pins as noted for opening or closing the lock. Preferably I provide said bolt means with an individual part or member which is operative in co-operation with the rest of the bolt, and substantially simulta-

neously therewith, said member being movable without the lock and into the jamb member to operate said keeper.

More specifically, the member for operating said keeper is in the form of a rotatable or bolt member 20 which is arranged to be projected into the jamb member simultaneously with the projection of engagement members 14, and to engage said keeper by the rotation thereof to move the keeper along the jamb piece so as to cause said pins to function. The rotatable member may for this purpose be provided with actuating means at the end thereof such as a bit 21 which is preferably arranged in the manner of a key. Said rotatable or key member enters the jamb piece through an opening 22, which is provided with a notch or recess 23 to permit the passage of said bit, while the keeper is provided with an opening or slot 24 into which said bit is arranged to enter, so that when said key member is rotated, the bit will operate as a crank to move the keeper. The angular rotation of said key member is such as is suited to the particular design of lock but as shown equals substantially 180°, while the form and specific arrangement thereof is as shown preferably of round cross section and located between said engagement members and in spaced relation thereto. Moreover, said key member may be made sufficiently rigid and strong to serve the function of providing a separate bolt member to increase the strength of the lock, thus constituting the bolt means in effect a two-stage compound bolt.

The members of the two-stage bolt are preferably operative as a unit by a central or unitary actuating mechanism, since said bolt is projected as a unit, the rotation of the key member occurring after such projection. For this purpose and as a preferred way of securing such unitary action, I provide said key member with an elongated shank 20ª, the cross head 16 having engagement with said shank, said shank having cooperation with the actuating mechanism of the lock so that it may be moved outwardly or inwardly, whereby said cross-head is moved in turn to project or retract the engagement members 14 carried thereby simultaneously with the movement of said key member, and in the same direction. Thus said shank has a bearing neck 25 to engage said cross-head, said cross-head being arranged at this point in the form of a collar to be carried by said shank while permitting free rotational movement of said shank therein. A bearing plate or bar 26 is secured to said carrier as by means of screws to permit of the easy assemblage of said shank within the carrier.

To move said shank along the lock for projecting or retracting the bolt means, suitable means in the form of a crank mechanism or the like is provided, through the rotation whereof a translatory motion is imparted to said shank. Thus I provide a member such as a disk 27 rotatable about a stem 28 and carrying means for reciprocating said shank back and forth along the lock such as a spiral cam member 29 which engages said shank within a peripheral groove or recess 30. Thus when said cam member is rotated about its axis, then, since the shank has continuous engagement therewith, it is reciprocated back or forth according to the direction of rotation of said cam member. Said cam member may extend in its spiral form through any angle that is desirable to impart the necessary force when the disk 27 is rotated by the stem 28 as by actuation of the knob 31, and to insure a smooth operation of the lock mechanism. Said cam member extends for this purpose preferably through an angle of approximately 360°, a portion 29ª thereof being concentric with the axis of the disk 27, so as to impart no translatory movement to said shank member through a turn of said disk of approximately 90° for a purpose to be disclosed hereinafter. The shank 20ª is mounted for suitable sliding movement along the lock as within the opening 32 in the lock at one end thereof and by means of mechanism within the lock suitably arranged for this purpose such as a stem 33 which is mounted co-axially with said shank and in telescopic manner therewith so as to enter the bore 34 thereof to support said shank and retain the same in slidable relation along a definite axis. The stem 33 is preferably mounted upon a sleeve 35 which is mounted upon the stem 28 so as to permit of a free rotation of said stem within said sleeve as for the purpose indicated above of actuating the disk 27.

To secure the requisite rotation of said shank and consequently of the bolt or key member 20, a pinion 36 is provided upon the shank, said pinion being co-operative with a plurality of spaced teeth 37 borne by the disk 27 and arranged to cause rotation of said pinion through an angle of approximately 180° which is the angular throw of the member 20 necessary to close or open the lock. Said teeth are positioned preferably adjacent to the periphery of said disk and without the cam member, and thus engage said pinion only when said key member is projected into its farthest position outwardly of the lock, while when said key member is wholly or partially within the lock, said teeth are spaced from said pinion axially of the lock so as not to mesh with said pinion but to be free to pass beneath the shank 20ª which is of smaller diameter than the pinion.

The operation of the lock as thus far dis-

closed is as follows: With the lock in open position as shown in Fig. 1, in order to close the lock, the disk member is rotated in the direction of arrow *a*. The cam member will project said key member outwardly of the lock, but no rotation will occur since the teeth and pinion do not mesh. Indeed rotation is preferably prevented in the construction shown until said key member has reached the limit of its outward position. To insure against accidental rotation therefore, a guide 38 is arranged to cooperate with the shank in a suitable manner as by means of a track or non-circular surface 39 provided along said shank. However, when the cam member has projected said key member the desired distance, the teeth 37 come into meshing engagement with said pinion, as shown in Fig. 7, and cause said key member to rotate and operate the jamb piece mechanism as disclosed hereinbefore. To permit of the rotation of said shank, the flat surface 39 terminates in an annular groove 40 so that when the bolt has reached its limit of throw, said groove will coincide with the guide 38 to receive the same and permit rotation as aforesaid. Further rotation may be prevented by any suitable construction as a stop 41, while the spring 42 serves to engage said disk as within a notch 27ª and resiliently grip the same at its limits of motion. The portion 29ª of the cam member continues to engage the shank while rotation thereof occurs, and translatory movement is stopped, thus providing for a smoother operation between these parts and better structural co-operation.

To open the lock, said disk member is rotated in the direction of arrow *b*, so that while rotation occurs immediately, no translatory motion will take place until the rotary movement is first completed. When rotary movement is completed, the guide 38 is in a position to be received by the flat cut-out or facet 39 while the spiral portion of the cam member is ready to retract the bolt. The limit of movement inwardly of the lock is reached when the end of the bolt strikes the sleeve 35 and the inner end of the spiral may have a lug 29ᵇ to limit the movement in this direction.

My invention is not to be understood as being confined to the particular operating arrangement disclosed, nor to the particular motions and combination of motions disclosed, but contemplates rather as stated within the objects of this invention such movement of the key member and its co-operating parts as will cause reciprocatory and rotary motions of one or more of the members of a compound bolt structure.

I prefer to arrange a cylinder 10ª in coaxial and co-operative relation to the stem 28 so that when said cylinder is operated in the usual manner for opening the lock, a rotational force will be transmitted directly to the disk member through the medium of said stem. However, since the cylinder is not operative by turning the knob 31, the nature of the co-operating parts is modified to permit of the disk 27 being rotated without rotating or operating the cylinder. For this purpose, I sever said stem to provide a portion 28ª which is arranged to engage the portion 28 as desired, and having for this purpose a notch or cut-out 43 to receive a corresponding extension or lug 44 in the portion 28. The portion 28ª is provided with a head 45 received within a countersink of the sleeve 35 to prevent the movement of said portion inwardly of the lock. The member 28, however, is movable relatively to said sleeve, as when the knob 31 is pulled in an outward direction. The engagement between 28 and 28ª is then broken, and the knob may be rotated to turn the disk member as by means of a spline 46. In the meantime the portion 28ª is held from rotation as by means of the tongue 47 which engages the same in a usual manner as within an opening 48 thereof. When a rotation of the disk member through a suitable angle has been completed, the portions of the stem re-engage automatically through the force of a spring 48 which tends to press the member 28 inwardly as by abutment between the disk 27 on the one hand and the collar 49 provided upon said member 28 on the other. Said spring thus operates also to retain said disk member in its proper position, while the sleeve 35 serves to retain the portions of the stem in the necessary reliable relation to each other, said sleeve being retained in position as by means of the cover plate 50 and the oppositely located cam member acting through the stem 33.

To properly carry the keeper 19 within the jamb member, extensions 51 are provided at the ends of said jamb member, said extensions having guideways 52 to slidably receive the end portions of said keeper, plates 53 being secured to the jamb member to retain said carrier therein. To insure that said keeper will remain in open or closed position, means are provided engaging the same, as for instance the detents 54 arranged to seat in the recesses 55 of the keeper. Since a detent is provided at both the upper and lower ends of the jamb piece, a sure and reliable interlock and engagement is provided for said keeper. The detents are arranged to be spring pressed for automatic operation and are positioned preferably within the bores 51ª provided in said extensions for this purpose. Each bore has an enlarged portion to receive a flange 56 borne by said detent, and a spring 57 mounted about said detent and pressing against said flange to force the detent outwardly into co-operation with said keeper to retain the

same against unintended movement whether the lock is open or closed, except in the manner provided for in this invention by the operation of the bolt means.

I claim:

1. In a door lock, the combination with a door member and a jamb member, of a bolt projectable from one member into the other member, a keeper movable in the latter mentioned member for interlocking with the bolt when so projected, and a key member movable in the direction of the bolt to actuate the same and rotatable to actuate the keeper.

2. In a door lock, the combination with a door member, and a jamb member, of a bolt mounted in one of said members and projectable therefrom into the other member, a keeper movable in the latter mentioned member for interlocking with the bolt when so projected, a rotary member associated with said bolt member, said keeper being operative by said rotary member to cause the aforesaid interlocking action, and manual means to project said bolt and to cause the rotary member to actuate said keeper.

3. In a lock, the combination with a jamb member having a movable keeper, of a bolt having a plurality of locking members, and actuating means to operate one of said locking members angularly of the other member to move said keeper into engagement with the other bolt member.

4. In a lock, the combination with a jamb member having a movable keeper, of a bolt having a plurality of locking members projectable into said jamb member and into proximity to said keeper, one of said bolt members being movable for moving said keeper into position to interlock with the other bolt member after the bolt members have been wholly projected into the jamb member.

5. In a lock, the combination with a jamb member having a movable keeper, a casing and actuating means within the casing, of bolt means comprising a plurality of bolt members arranged to be projected simultaneously into said jamb member by said actuating means, one of said bolt members being rotatable and having engagement with said keeper to move the same and cause said keeper to engage the other bolt member.

6. In a lock, the combination with a jamb member, a casing, and actuating means therein, of bolt means operative by said actuating means and comprising a plurality of bolt members, one of which is rotatable and is provided with a tongue, said bolt means being engageable with said jamb member, and means carried by said jamb member and engageable with said tongue to render effective the engagement with the other member.

7. In a lock, the combination with a plurality of parts, of a bolt extending therebetween to lock the parts together, said bolt comprising a plurality of bolt members arranged for movement between said parts, one of said bolt members having a compound motion, and means operative by the same for rendering effective the interlock between said parts.

8. In a lock, the combination with a lock member and a jamb member, of bolt means projectable from said lock into said jamb member, said jamb member having a keeper movable therein, said bolt means comprising a member arranged for rotation so as to cause said keeper to move as aforesaid.

9. The combination as in claim 8 wherein a cross-head is provided to permit the last mentioned bolt member to be carried by said rotatable bolt member so as to be projectable outward thereby, said cross-head being journaled upon said rotatable bolt member.

10. In a lock, the combination with means arranged for reciprocation along the lock, of a rotatable spiral cam member, said means being arranged to engage said spiral cam member and to be reciprocated thereby when the same is rotated back and forth, means including a stem being provided to support said cam member, a sleeve being journaled upon said stem, said sleeve having means engaging the reciprocatory means to guide the movement thereof along the lock.

11. In a lock, the combination with a cylinder and means arranged for reciprocation along the lock, of actuating means for causing the reciprocation aforesaid, said means including a rotatable stem consisting of a plurality of engaging portions, one of said portions having direct co-operation with said cylinder, another of said portions having co-operation with said actuating means, said portions being normally in engagement with each other whereby a force operating said cylinder is transmitted to said actuating means, but said portions being disengageable to permit said actuating means to be operated independently of said cylinder.

12. The combination as in claim 11 wherein the portions of said stem are co-axial, a sleeve being provided to retain said portions in alinement.

13. In a lock, the combination with means arranged for reciprocation along the lock, and actuating means for causing the reciprocation afore-said, of means including a stem co-operating with said actuating means and arranged to support the same, and a sleeve journaled upon said stem, said sleeve having means engaging the reciprocatory means to guide the movement thereof along the lock.

In testimony whereof I affix my signature.

MOSES B. DISKIN.

DEFENDANT'S EXHIBIT 211

June 28, 1962

Mr. R. H. Wilber
Supt. Motive Power & Equipment
Detroit, Toledo & Ironton Railroad Company
4501 Colborn
Dearborn, Michigan

Dear Mr. Wilber:

In cooperation with our Chief Engineer, Mr. G. H. Schneider, and the head of our Experimental Section, Mr. S. H. Hamps, we have developed a commercial application of our present D-F Utility Loader incorporating the removable door post and the removable doorway members.

The principal differences between the car you saw at our plant and the proposed car are as follows -

a. The adjustable vertical plate is reduced in thickness from 3/8" to 1/4" high tensile steel

b. The 2½ x 2½ x 1/4 angle is reduced to 2 x 2½ x 1/4 angle (same as the standard D-F Loader)

c. Our standard D-F crossmember is used in place of the special crossmember

d. All wood and metal rub stripe are eliminated

e. 1/2" exterior grade plywood is substituted for the 3/4" thickness

The complement of the car is similar to the standard 18 bolt D-F Loader with the exception of the wall members which consist of three fixed wall members and six adjustable wall members which are made up of 144 individual wall members. The balance of the complement is -

60 crossmembers
2 removable door posts
24 new style D-F removable doorway members
16 deck boards

Based on our experience we believe the above complement will take care of most any combination of load that may be required; however, the combination can be increased by the addition of wall members, crossmembers, doorway members or deck boards, or likewise if in your judgment the complement is too large, it can be decreased.

RDP 6

June 18, 1952

Mr. R. W. Wilber
Detroit, Toledo & Ironton Railroad Company

The proposed car has the standard B-F crossmember which permits an adjustment of 1/2" lengthwise of the car and the adjustable wall members permit an adjustment of 1" vertically in the car.

Our quotation on the above complement of material installed in 200 50'6" length 15' double door freight cars, based on the cars being delivered to our plant at Plymouth, Michigan, with the side linings removed but the furring strips and clips in place, and the end lining in place, with the side door posts fabricated to our specifications, is $2650.00 per car cut installed complete f.o.b. our plant at Plymouth, Michigan, terms net tenth prox.

The above quotation is based on present material and labor costs and would be subject to adjustment in price if there is any increase in the cost of either labor or material as a result of the present strikes and pending labor negotiations.

Delivery of these cars can be made at the rate of 100 cars per month starting in November or December of this year provided we are awarded the contract in sufficient time to obtain the necessary raw materials and the present steel strike is terminated so that we can obtain materials in order with the several mills.

We particularly appreciate the opportunity of quoting you on this alternate car and would welcome the opportunity of installing this equipment for you. As you know from your inspection of the car and the discussions with our engineers, it incorporates all the best features of our standard B-F Loader with the addition of the adjustable vertical feature permitting almost unlimited combinations of loads.

As stated in another letter to you today, if we are awarded a contract for equipping these cars, you may be assured that we will make every effort to take care of your requirements to your satisfaction.

Very truly yours,

EVANS PRODUCTS COMPANY

H. C. Webb
Vice President

HCW:B

DEFENDANT'S EXHIBIT 212

AUG 14 1952

ORIGINAL

DETROIT, TOLEDO AND IRONTON RAILROAD COMPANY

Purchase Order No. № 73371

BILLING INSTRUCTIONS P.O. 73371

BILL OF LADING		PACKING SLIPS	INVOICES
		A numbered packing slip must be placed in each package. Outside shipments must have shipping slip enclosed in stamped envelope and nailed inside car near door.	All Originals must be mailed to Dearborn. Cash Discount must be computed on face of Invoice, and Net Amount shown.

DETROIT, TOLEDO & IRONTON R. R. CO., of Dearborn, Michigan, first party, hereby agrees to purchase and receive, and

(Evans Products Co.
Plymouth, Michigan)

DATE OF ORDER August 13, 1952

DELIVERY REQUIRED
150 Cars per month starting in November or December 1952.

Invoices shipped in excess of quantity specified will be returned at your expense.

second party agrees to manufacture, sell and deliver materials specified herein subject to the terms and conditions stipulated herein and on back hereof:

SHIP TO D. T. & I. R. R. CO.
R. W. Wilber,
Flat Rock, Mich.

F.O.B. Your Plant, Plymouth, Michigan

TERMS Net 10th Prox.

ROUTING C&O(PMD)-CARLETON-DT&I

QUANTITY	DESCRIPTION OF MATERIAL	PRICE
	Per Car Set	$2,523.00
300	Car Sets of D. F. Equipment to be furnished (18-SP) and applied to 300 DT&I Box Cars in Series 3000-3299 in accordance with Mr. W. G. Webb's letter quotation dated June 18, 1952.	

Pltf Ex. ____
Deft. Ex. 212
1-22-54

CONFIRMING TO Mr. WEBB 8-8-52

B 32034
CER:jw

"RATING DO-U-3 SHIP NOVEMBER AND DECEMBER 1952
CERTIFIED UNDER NPA ORDER M-73"

Bill of Lading must be attached to all original invoices

DETROIT, TOLEDO AND IRONTON RAILROAD COMPANY

By _____
PURCHASING AGENT

№ 73371